1919 - 1921
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COLONY AND PROTECTORATE OF KENYA

DEPARTMENT OF AGRICULTURE.

IMPERIAL BUR
26 JUN. 1922
OF MYCOLOGY

ANNUAL REPORT.

1919-1920.

NAIROBI.

PRINTED BY THE GOVERNMENT PRINTER.

1921.

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1921.

ANNUAL REPORT

OF THE

Department of Agriculture,

FOR THE YEAR ENDED

31st March, 1920.

The late Director of Agriculture (Mr. A. C. MacDonald) resigned his appointment and proceeded on leave on 19th June, 1919. The Acting Chief Veterinary Officer (Major H. H. Brassey-Edwards) was appointed Acting Director and carried out the duties of the two posts with ability until the arrival of the undersigned on December 8th, 1919, on transfer from the service of the Union of South Africa.

Having regard to the short period between my arrival and the end of the year reviewed this report must necessarily be brief.

STAFF—ORGANISATION, ETC.

Appendix I. is a record of the staff of the Department as at 31st March, 1920. It will be seen that a number of appointments were vacant. That together with the absence of Officers on leave in many cases deferred beyond the usual period on account of the war, reduced the active strength of the Department considerably. As a consequence difficulty was experienced in maintaining Departmental services with efficiency. There also remained evidence of the effect of the depletion of staff during the war. Much of the work fell into arrear, Experimental and Stock Farms could not receive that attention which they deserved, and new activities which the progress of the agricultural industry necessitated had to be suspended. In some cases, notably the Experiment Stations and technical services, the provision of staff and funds was entirely inadequate, and under these conditions neither competent administration nor direction could be expected to secure efficiency.

The organisation created by the late Director was undoubtedly sound and met the needs then existing. Such changes as are contemplated will involve chiefly the creation of some new Divisions and a redistribution of the work under them, together with an increase in the personnel.

Reference should, however, be made to one serious defect in the establishment of the Department. Agricultural Chemistry is not represented, such work as is undertaken is done in a separate Department of Chemical Research. It is submitted that that organisation is fundamentally unsound and that scientific and technical services having a direct bearing upon an industry should fall under the control and direction of the Officer responsible for State services in relation to that industry.

GENERAL.

An important legislative measure "The Cleansing of Cattle Ordinance" was introduced and dealt with in the Legislative Council, preliminary steps were taken to apply the Statistics Ordinance of 1918 in respect of Agricultural, dairying and pastoral pursuits, and to take the first Agricultural Census. In collaboration with the East African Agricultural and Horticultural Society an organisation dependent largely upon the assistance and effort of the Department was set up to start an East African Stud Book.

As Chairman of a Departmental Committee the writer was engaged in making an Economic Survey of the extensive areas to be served by the projected Railway to serve the Uasin Gishu Plateau and Trans-Nzoia, and the Statistical Officer of the Department acted as Secretary thereto.

The first course of agricultural instruction was inaugurated, and at the Kabete Experiment Farm one of a month's duration in Agriculture and allied subjects was given primarily to meet the needs of the new settlers then arriving in the country. It is intended that these short courses of agricultural instruction should be continued.

Arrangements are being made for the conduct of experimental work along definite lines, and for the technical staff of the Department to render advisory services by personal visits to farms and by correspondence. These services appear to have been suspended to a considerable extent during the past few years on account of conditions created by the war, and to an appreciable degree the Department has, through no fault of its own, fallen behind the demands and needs of the industry.

The first post-war Agricultural Show was held at Nairobi in October 1919. Though not fully representative of agricultural pursuits, particularly in respect of stock exhibits, it stimulated interest and led to the formation of an Agricultural and Horticultural Society charged under its constitution with the control and management of Agricultural Shows and allied activities throughout the Colony.

CROPS.

The season covered by this report was a favourable one for farming operations, good yields were obtained from the chief crops, no disease or pest afflicted them to a serious degree, and a good recovery was made from the effects of the exceptional drought which was experienced during the seasons immediately preceding the period under review.

Coffee.—The revival of the coffee trees after the severe drought and the almost entire destruction of the foliage by "thrips" was an encouraging feature. A record yield was obtained and the quality of the crop was remarkably high. Good prices were obtained for the output, the highest realised being £202 per ton for "peaberry."

It is estimated that the area under coffee has increased to 22,000 acres of which about 13,000 acres are in the Kyambu district. Improvements require to be made in the preparation and handling of the crop for marketing. In consultation with members of the Coffee Planters' Union consideration has been given to the desirability of giving effect to a system of coffee grading. The matter is still the subject of enquiry and it is seen that Coffee does not lend itself to the ordinary grading methods which can be applied to other products.

Through the lack of staff and other means, experimental work along definite lines has not been carried out but it is hoped that provision will be made in the near future which will enable the Department to carry out experiments upon coffee, both on its own experiment farms, and in co-operation with planters. As a first step it is proposed to carry out (*a*) Variety Trials; (*b*) Manurial Experiments; (*c*) Different methods of pruning.

Flax.—The high prices ruling for flax stimulated interest in the flax industry and a large amount of capital has been invested in it. The large importation of seed sown in 1919 obtained through the Flax Control Board has unfortunately been attended with most unsatisfactory results. Many growers have suffered heavy loss and the industry suffered a set back. It has been shown that the

seed was improperly packed for shipment in so large a consignment through the tropics and that its germinating power was seriously destroyed in transit. Representations have been made for a refund of a substantial part of the cost of the seed. The suitability of several areas throughout the Colony for flax growing has been demonstrated and there is reason to believe that the industry will become firmly established.

Preliminary steps were taken in connection with the formation of a representative Flax Association, discussions have taken place upon the introduction of a scheme of flax grading and arrangements were being made for further experimental work to be conducted at the Kabete Experiment Farm. The Flax Officer has rendered valuable assistance to growers in an advisory capacity.

Maize.—The shortage which was the result of the 1917-18 drought was more than made up, and with the heavy yield from the last season's crop a surplus will be available for export. The quality of the maize produced on European holdings compares favourably with the production of other countries, but though some of the maize grown by natives is of a type which is in demand for stock feeding, there is not unnaturally an absence of uniformity of quality. Enquiries are being made as to the measures which should be adopted in dealing with weevily infested maize prior to its export, and the provision of a scheme of grading is contemplated as soon as a regular export trade is assured and of a volume sufficient to justify the appointment of a Grader.

Wheat.—The supply from local sources remains insufficient for local consumption. In some districts wheat of good quality is grown, in others it is subject not infrequently to "rust," to an extent sufficient to make it a risky and unprofitable crop, but fortunately the efforts of Departmental and private enterprise have produced rust-resistant varieties, and it may be expected that a larger quantity of wheat will be grown locally in the future.

Sisal.—Large areas hitherto undeveloped are suited to sisal growing. Companies and individuals who are in a position to operate on an extensive scale are increasing the area planted, and a larger output may be expected in the future provided market prices enable a reasonable profit to be made. As a general rule the fibre is graded and the different "marks" are a fair indication of the quality of each firm's output but no attempt has yet been made to standardise the output of "East African" Sisal. It is a matter worthy of serious consideration whether uniform grading could be successfully carried out and whether it would be in the interests not only of individual firms but of the sisal industry.

Beans.—The promise of a considerable export trade has been arrested through the fall in prices, and the high costs of marketing.

Sugar Cane,—The area planted is extending and "plant cane" is now available for the establishment of sugar cane fields on a scale sufficient for the needs of a sugar mill. Hitherto the product has been marketed only in the form of "jaggery" which is in demand locally and is a form of sugar from which the molasses have not been extracted.

Coconuts.—On Estates under European ownership the area planted with palms is being extended along the coastal belt, but there is evidence that the coconut plantations in the possession or occupation of non-Europeans are for the most part neglected and are suffering from the tapping of the palms for "tembo."

Circumstances have not yet allowed the Coconut Preservation Ordinance of 1915 and the Coconut Trade Ordinance of 1915, passed on the recommendations of the Coconut Commission of 1914, to be put into operation.

Rice.—Little substantial progress is to be recorded. The continued effort of the Department and of administrative Officers appears to be frustrated by the indigency of the population and by the paucity of natives in areas where rice could be successfully grown.

Citrus and other fruits.—The supply of fruit of different kinds for local consumption is increasing, but there is at present no promise of an export trade being established. Arrangements are being made by private enterprise for the manufacture of lime juice preparations from lemons and limes both of which thrive well.

LIVE STOCK.

The position in respect of stock breeding cannot be regarded as satisfactory. On the economic side there is no assured market for a supply of beef cattle beyond the limited needs for local consumption. The dairying industry is making progress, though slow, but it cannot achieve large proportions until an export trade is established. That will involve the provision of Factory Dairies and these are not within sight. The Uplands Bacon Factory has been reorganised under new management and the prospects of a bacon industry are promising. The menace of the many diseases to which the stock, particularly cattle, are subject is great but happily those which are the cause of the most serious losses viz., East Coast Fever, Bovine Pleuro-Pneumonia and Rinderpest can be successfully controlled and limited to losses which should not

prevent progress, even if eradication should not be made possible with existing means and facilities. The greatest vigilance is required not only on the part of the Department but by the stockowner, and notwithstanding the existence of stock diseases and the considerable expenditure incurred both by the State and the stockowners on measures of protection and control, it should not be assumed that cattle breeding is unprofitable. In many areas throughout the country the pastoral and other conditions for successful cattle breeding are highly favourable. In my next report it is proposed to deal with the important live stock industry more fully. Further reference is made to stock diseases in the succeeding paragraphs dealing with Veterinary services.

VETERINARY.

Administrative and Executive Division.—The depletion of the staff through secondment to other administrations, particulars of which are to be found in the report of the Acting Chief Veterinary Officer, together with the failure to fill vacant appointments, greatly handicapped the discharge of Veterinary services to the satisfaction of the stock owning community. It is essential that the Veterinary staff should be maintained at full strength otherwise avoidable losses are suffered, and discredit is brought upon the staff and the administration.

The outbreaks of Rinderpest on European holdings numbered 80, and excepting in a few individual cases where the losses were abnormally high these outbreaks were successfully dealt with by "double inoculation," and the use of "anti-rinderpest serum." This disease is widespread throughout the Natve Reserves, but no facilities at present exist for dealing with it in those areas. Before they were allowed to be moved into the European settled areas 30,102 head of cattle were "double inoculated" at the Quarantine Stations. The average mortality was 2.5 per cent.

Serious outbreaks of pleuro-pneumonia spread from Native Reserves occurred among European owned stock. Active measures were taken to suppress this disease.

In three districts which had hitherto been believed to be free of East Coast Fever six outbreaks occurred. Experience has shown that on farms where dipping is carried out efficiently the losses from this disease, although it is endemic, are not of serious consequence, but instances are not uncommon in which the stockowner through carelessness or neglect fails to carry out the dipping and hand dressing operations properly with the result that heavy losses are occasionally suffered. Progress is being made with the erection by Government of public dipping tanks along

the main stock routes. Twenty four have been completed or are in the course of erection. Greater use is being made of the facilities offered by the Chemical Laboratory for the analysis of dipping fluid. During the period under review 873 samples were tested representing an increase of 30 per cent as compared with the previous year. Investigations showed that outbreaks of Trypanosomiasis in areas where "tsetse fly" was not to be found were due to mechanical transmission by means of other blood sucking flies.

The incidence of other diseases, and the action taken in respect thereto and the results obtained are detailed in the report of the Ag. Chief Veterinary Officer.

The total number of "trade" stock dealt with through the Quarantine Stations during the last three years is as follows:—

	1917-18	1918-19	1919-20
Cattle ...	23,201	19,351	30,102
Sheep and Goats ...	6,581	10,441	15,400
Horses and Mules ...	450	148	490

A fair estimate of the needs of the country in respect of meat for local consumption is reflected in the Returns of Animals slaughtered at the two chief towns, Nairobi and Mombasa. The figures are as follows:—

	1917-18.		1918-19.		1919-20.	
	Nairobi	Mombasa	Nairobi	Mombasa	Nairobi	Mombasa
Cattle ...	3,015	2,620	5,567	3,712	7,025	3,232
Sheep and Goats ...	20,194	10,214	19,930	11,714	23,422	8,335
Pigs ...	976	...	427	...	493	...
Camels ...	...	...	...	36	...	6

In order to facilitate the operation of the present system governing the movement of stock the number of honorary permit Officers has been increased. In connection with the Branding of Stock Ordinance 125 brands were registered during the year, 6 were transferred, 50 were cancelled, and 252 branding irons were issued.

Research Division.—Through the absence on leave of members of the staff and the failure to fill a vacancy considerable difficulty was experienced in carrying on the services of the Pathological Laboratory. Apart from the paucity of staff deficiencies in the "plant" and equipment increased the difficulties. That institution has been engaged during the year chiefly on the production of sera and vaccines. In several respects the results of Rinderpest immunisation and Pleuro-pneumonia inoculation were unsatisfactory. The Veterinary Pathologist has succeeded in elucidating the causes which were responsible for heavy mortality in rinderpest inoculation and has improved the means hitherto available in respect of pleuro-pneumonia inoculation in this Colony by the production of a vaccine from a pure culture virus. Particulars of these investigations are to be found in the Veterinary Pathologist's report and need not be repeated here.

Outbreaks of Heartwater and Blue-Tongue in sheep, and Tuberculosis in cattle received from Uganda were also investigated.

The production of sera and vaccines, etc., during the year under review are worthy of note. They were comprised as follows:—

	Doses.
Anti Rinderpest Serum	235,617
Pleuro-pneumonia vaccine	3,638
Anthrax vaccine	18,740
Colon Bacillosis vaccine	5,247
Ulcerative Lymphangitis vaccine ...	4,525
Blackquarter vaccine	12,360
Kikuyu Fowl Disease	10,905
Trypanblue (Bovine)	400
Trypanblue (Canine)	304

The building forming the Laboratory Extension has been completed but there remains a number of rooms to be equipped for which funds are not available. A new Hostel has been erected, but the housing accommodation for the staff is entirely inadequate.

The "Laboratory plant" and some of the buildings are in a most unsatisfactory condition and state of repair. Great inconvenience and loss of time has been suffered in consequence. It is important that an institution of this kind responsible for an output of such products as sera and vaccines should be in every respect in a high state of efficiency otherwise disastrous results may occur.

The total expenditure for the year 1919-20 amounted to £16,213. The value of sera and vaccines sold amounted to £12,534, which together with £1,309 for supplies from the Pathological Division, but included under the Revenue Head "Testing, Dipping Fees, etc.," makes a total revenue of £13,843. Of this sum no less than £11,023 represented sales of Anti-Rinderpest Serum to other Colonies and foreign countries.

ENTOMOLOGY.

The new Laboratory situated in an isolated position on the Kabete Experimental Farm was completed and an insectary and stores room have also been provided. The choice of this site cannot but be regarded as most unfortunate. The Laboratory is placed in no sort of relationship to the remainder of the Kabete institution and it should in my opinion have been built on the same site near the Mycological Laboratory within the precincts of Nairobi.

Investigations upon outbreaks of Trypanosomiasis along the Nzoia and Rongai Rivers, and in the Kericho districts were carried out and reported upon. The presence of blood-sucking flies in the latter district was enquired into and a Simulium which is apparently the cause of the poor state of health of some Lumbwa natives was investigated.

Work has been done on the Flax Caterpillar and the results were published.

A favourable report was received from the Imperial Institute upon the cocoons of Mulberry Silkworms and it is intended to proceed further with work on sericulture.

Inspections of Coffee plantations and Citrus nurseries have been made. A comprehensive bulletin dealing with results of investigations upon the "Coffee Bug—Antestia lineaticollis" was published. A representative and instructive Entomological exhibit was made at the Nairobi Agricultural show and the classification of the insects under their host plants together with the catalogue of the exhibit which furnished full particulars formed a valuable addition to Entomological literature.

The Department is indebtetd to the Imperial Bureau of Entomology for assistance rendered in identifying and naming a considerable number of insects forwarded to it.

MYCOLOGY.

The new Laboratory was completed and occupied in May. Investigations have been made upon the following diseases:—

COFFEE. Leaf disease (*Hemileia vastatrix*); Leaf Spot (*Cercospora coffeicola*); Leaf Blotch (*Gloesporium coffeanum*); Berry Disease (*Septoria*); Die Back (*Colletotrichum coffeanum*); and (*Phomopsis*).

FLAX WILT. (*Fusarium lini*) was found at Kericho and Sotik and is probably present elsewhere.

Among forest trees work on *Selerotinia* in young M'hogo trees (*Brachylaena Hutchinsi*) was continued, and "damping off" in young seedlings of East African Cedar (*Juniperus procera*) was investigated and found to be due to a species of Pythium. Pruning and spraying operations have been undertaken with a view to controlling the Camphor tree disease. A number of other minor investigations were carried out.

The Mycologist supervised the trials with wheat selections and hybrids and a useful bulletin reviewing the present knowledge of wheat growing in Kenya was written and compiled by him and published.

Regulations under the "Diseases of Plants Prevention Ordinance" were redrafted and published.

The number of specimens received at the Laboratory for examination was 90.

PLANT IMPORTS.

818 consignments of plants, trees and seeds representing in value £3,712 were examined by the Inspector. In addition the same officer was engaged on examinations of certain export products. In this connection 30,529 bags of beans were dealt with and certificates of purity were issued. 2,435 bags of coffee and 20,803 of maize were also examined for export, and 2,435 bags of beans and maize were fumigated before being exported.

EXPERIMENTAL FARMS.

Kabete.

Trials continue to be conducted on Wheat, Flax, Beans and Peas, Sugarcane, rotations, and sundry crops and plants, and useful information is being obtained, but there is need for experimental work to be conducted along more definite lines. Arrangements are being made for that to be done so that accurate data may be obtained.

A Hostel was erected with the aid of two memorial grants of £1,000 each from Messrs Lamberts Ltd., and Sisal Ltd., and in accordance with the conditions laid down by the donors it is to provide facilities for residence and instruction to settlers coming to the Colony.

A course of instruction in agriculture and allied subjects of one month's duration was given by the staff of the Department assisted by officers of other Departments and it was attended by about 20 men who had recently arrived to take up holdings in the Colony. Their satisfaction as to the value of the course was expressed. Courses of this kind should be of great assistance to the new settler in acquiring some knowledge of agriculture and of local conditions. It is intended to make these a feature of the work at Kabete and to provide useful instruction for the farmers already established on the land.

Kibos.

Trials upon the following crops have been conducted, cotton, maize, beans, simsim, sugarcane, rice, groundnuts, coffee, chillies, cashewnuts and several fruits.

Plants and seeds have been distributed to both European and native agriculturists.

The Officer-in-charge has devoted his attention to the development of agriculture in the Kavirondo Native Reserve, and some practical instruction in agriculture has been given to a few native pupils at Kibos.

Mazeras.

Owing to changes of management and for other reasons the report of the Officer-in-charge does not deal adequately with the work which is being carried on. Arrangements have been made for experimental work to be re-established, and for nursery plants and seeds for distribution to be raised. Useful information of an advisory nature has been given by correspondence and otherwise upon tropical agriculture.

Uasin Gishu.

Provision had been made on the Estimates for a new Experiment Farm to be started near Eldoret, but up to the end of the period covered by this report no staff had been appointed to it and no work had been undertaken.

Naivasha Stock Farm.

This farm had not yet recovered from the severe drought of the previous year. Under such conditions it became over stocked as the usual number of surplus stock had not been sold. There is nothing new to record in respect of the behaviour of the breeds, excepting the success of the experiment of crossing "Masai" ewes with pure bred Karakul Rams.

Two sales of stock took place in the year under review when cattle, sheep, goats and donkeys to the value of £6,896 were sold. That sum is, however, inclusive of £2,988 realised in respect of bulls imported from South Africa for purposes of sale. Based on the number of rupees realised there was a considerable drop in the prices at the February 1920 sale as compared with previous sales, the reason undoubtedly being the inflation of the value of the rupee as expressed in sterling.

It is interesting to note that the death rate for the year was 4.8 per cent. for cattle and 7 per cent. for sheep.

METEOROLOGICAL.

Observations are being made at 180 "Rainfall Stations" and 21 "Temperature Stations." The records for the period 1914-19 are being compiled for publication; and the Meteorological report for the period under review will be published in a separate report.

FINANCIAL.

Expenditure	Amount provided in Estimates for 1919-20.		Amount actually spent 1919-20.	
	£	£	£	£
Agriculture.				
Personal Emoluments ...	12,386		8,646	
Other Votes	11,396		13,482	
		23,782		22,128
Veterinary.				
Personal Emoluments ...	15,433		13,203	
Other Votes	7,170		9,557	
		22,603		22,760
Pathological.				
Personal Emoluments ...	6,003		5,045	
Other Votes	10,210		10,915	
		16,213		15,960
Totals £ ...	...	62,598		60,848
Special Expenditure.				
Totals £ ...	...	4,557		3,074

Revenue.	Revenue Estimated 1919-20.	Revenue actually collected 1919-20.
	£	£
Agriculture.		
Sale of Farm Produce and Stock	8,000	11,725
Veterinary.		
Testing, dipping fees, etc...	5,600	5,661
Pathological.		
Sale of Sera, Vaccines, etc.	10,180	7,809
Totals £ ...	23,780	25,195

My impressions of the prospects and conditions of the agricultural industry in Kenya must be awaited in my next report as it is not appropriate to include them in this report which covers a period of only a few months of my residence in the country.

Submitted with this report are the following appendices:—

Appendix (a)—Staff and appointments as at 31st March, 1920.

,, (b)—Annual Report of Ag. Chief Veterinary Officer.
,, (c) ,, ,, ,, Veterinary Pathologist.
,, (d) ,, ,, ,, Entomologist.
,, (e) ,, ,, ,, Mycologist.
,, (f) ,, ,, ,, Plant Import Inspector.
,, (g) ,, ,, ,, Coffee Officer.
,, (h) ,, ,, ,, Flax Officer.
,, (i) ,, ,, ,, Horticulturist.
,, (j) ,, ,, ,, Manager—Kabete Experiment Farm.
,, (k) ,, ,, ,, Manager—Kibos Experiment Farm.
,, (l) ,, ,, ,, Mazeras Experiment Farm.
,, (m) ,, ,, ,, Manager—Naivasha Stock Farm.

December, 1920.

ALEX HOLM,

Director of Agriculture.

APPENDIX A.

STAFF LIST

as at 31st March, 1920.

ADMINISTRATIVE.

ALEX HOLM, F.H.A.S., M.R.A.S.E, S.E.A.C., (DIP. HONS)., Director.
C. J. MONSON—Assistant to Director and Advisor for Tobacco.
L. D. CARPENTER—Agricultural Superintendent.
H. S. LAND—Accountant.
J. MORTIMER—Clerks (5).
R. F. DALZELL ARMSTRONG.
E. W. MCLACHLAN.
F. PARKER.
E. D'SOUZA—3rd grade clerk.
G. M. HAMILTON—Flax Instructor.
A. D. LE POER TRENCH—Coffee Plant Inspector.
W. J. DOWSON, M.Sc.—Mycologist.
(VACANT)—Pig and Dairy Expert.
C. B. USSHER—Horticulturist.
(VACANT)—Cerealist.
H. M. LOETER—Draughtsman.
J. W. SPARROW—Agricultural Instructors.
F. B. R. BUTLER.
H. H. HOLDER.
S. AUSTIN—Telephone Operator.

Economic Plants Division.

H. POWELL—Chief of Division.
(VACANT)—Tropical Agricultural Instructor.
J. B. DOPWELL—Foreman Plant Instructor.

Naivasha Stock Farm.

J. H. D. BEALES—Manager.
C. B. ARMSTRONG—Assistant Manager.
(VACANT)—Stockman.

Kabete Experimental Farm.

A. J. Wilson, M.C., C.D.A. (Edin.)—Manager.
(Vacant)—Station Assistant,
J. D. Ritchie—Clerk and Storekeeper—(On leave).

Uasin Gishu Experimental Farm.

J. Johnston, B.Sc., N.D.A.—Manager—(On leave).

Entomological Division.

T. J. Anderson, M.A., B.Sc., F.Z.S., F.E.S.—Entomologist —(On leave).
F. W. Dry, B.Sc.—Assistant Entomologist.
A. H. Wilson—Plant Import Inspector—(Temporary).
H. Wilkinson, A.R.C. Sc.—Entomologist for Coffee.
T. D'Cruz—4th Grade Clerk.

APPENDIX **B.**

ANNUAL REPORT

OF THE

Acting Chief Veterinary Officer

FOR THE YEAR ENDING

31st March, 1920.

Staff.

AUTHORISED ESTABLISHMENT.

(1)	Chief Veterinary Officer	1
(2)	Deputy Chief Veterinary Officer	1
(3)	Veterinary Officers	14
(4)	Permit Officer	1
(5)	Office Superintendent & Assistant Accountant ...	1
(6)	Registrar of Brands	1
(7)	Stock Inspectors	19
(8)	Storekeeper	1
(9)	European Clerks	3
(10)	Veterinary Asistants	3
(11)	Clerks (4th Grade)	2

(1) THE CHIEF VETERINARY OFFICER was absent from the Protectorate throughout the whole year. He was seconded to the War Office for a time, was then granted leave and, later, was seconded for duty with the Government of Peru.

(2) THE DEPUTY CHIEF VETERINARY OFFICER was absent on leave until 13th January, when he was appointed Acting Chief Veterinary Officer.

(3) FOURTEEN VETERINARY OFFICERS.

(1) Lt.-Col. A. G. Doherty was absent on leave throughout the year.

(2) Major H. H. Brassey Edwards held the appointment of Acting Chief Veterinary Officer until January 13th when he was appointed Actlng Deputy Chief Veterinary Officer.

(3) Major F. J. McCall was seconded to Tanganyika Territory Administration until February 18th on which date he was definitely transferred to that Administration.

(4) Mr. O. Dixon was stationed at Eldoret.

(5) Captain W. W. Henderson held the post of Acting Deputy Chief Veterinary Officer until January 13th, when he was posted to Nakuru as District Veterinary Officer.

(6) Captain R. C. Wheeler was District Veterinary Officer, Nakuru, until June 19th, 1919 when he proceeded on leave.

(7) Captain F. J. Sheedy was absent from the Protectorate throughout the whole year. He was on leave for a portion of the year and was then seconded to Tanganyika Territory Administration.

(8) Mr. A. W. Carter was District Veterinary Officer, Lumbwa, until September 5th, 1919 when he proceeded on leave.

(9) Mr. T. C. Bradshaw was seconded for duty to the Kabete Laboratory except for the period April 1st to December 31st, when he was posted to Nakuru as District Veterinary Officer.

(10) Mr. M. H. Reid was stationed at Nyeri.

(11) Captain J. Cameron arrived on first appointment on August 8th, 1919 and was posted to Lumbwa as District Veterinary Officer.

(12) Mr. A. S. Mathias arrived on first appointment on December 8th, 1919 and was posted to Eldoret.

(13) Catpain J. N. Cooper has been appointed but has not yet arrived in the country.

(14) Vacant.

(4) The Permit Officer (Mr. J. B. Banks), (5) The Office Superintendent and Assistant Accountant (Mr. A. C. Hunter) and (6) The Registrar of Brands (Mr. J. E. Harrison) were on duty throughout the year.

(7) Nineteen Stock Inspectors:—

One post was vacant at the beginning of the year and two others fell vacant later. Three new appointments were made to fill these vacancies. Mr. H. G. Ulyate proceeded on leave on July 29th and Mr. E. Bladen Taylor on December 12th.

(8) The Storekeeper (Mr. C. E. Simmons) was on duty throughout the year.

(9) Three European Clerks:—The following arrived on first appointment:—(1) Mr. G. J. Robbins on November 17th, 1919. (2) Mr. R. A. Hawkins on March 16th, 1920 and (3) Mr. J. L. Byrne on March 23rd, 1920.

(10) Three Veterinary Assistants:—Mr. K. Rahman was stationed at Mombasa, Mr. G. S. Hassan proceeded on leave on August 23rd, 1919 and Gulam Rasul Khan was transferred from the King's African Rifles on January 1st.

(11) Two Non-European Clerks:—One was stationed at Nakuru and the other was posted to Eldoret.

Veterinary Officers.

The authorised establishment of Veterinary Officers is fourteen but owing to the absence of Officers on leave and to other causes the actual number available for duty in the field during the greater part of the year was five. These Officers were stationed at Eldoret, Lumbwa, Nakuru, Nairobi and Nyeri.

Housing Accommodation.

Some difficulty was experienced in obtaining housing accommodation for certain members of the staff, particularly for married men, and a certain amount of dissatisfaction was expressed on this account.

DISEASES OF LIVESTOCK.

A.—Diseases of Cattle.

Before considering in detail the various contagious and infectious diseases which affect cattle in this Protectorate it is thought advisable to review briefly the situation in connection with tick-borne diseases, rinderpest and pleuro-pneumonia.

These three conditions have three points in common:—(1) They each constitute a serious menace to the stock industry of the country; (2) They are widespread over large areas of our native reserves and (3) they are, for all practical purposes, preventable.

Tick-borne diseases and pleuro-pneumonia are practically always spread by the movement of infected cattle and the same is true of rinderpest to a certain extent although rinderpest infection is not infrequently spread by game or through natives carrying diseased meat from place to place.

As it is impossible under present conditions to prevent all illicit movement of cattle from infected native reserves it is evident that there is a constant danger of disease being spread from them to susceptible herds either on European-owned farms or in other native reserves. On account of this danger the energies of practically the whole of the Veterinary staff have been concen-

trated on the prevention and, where possible, the eradication of stock diseases in the area occupied by European farmers. The results are not very encouraging owing to the constant influx of disease from the surrounding infected native reserves and no real progress will be made in the suppression of these diseases until the necessary staff and equipment are provided to deal with them at their sources, namely, in the native reserves.

The losses of stock throughout the native areas from preventable disease must be enormous but these would not be prevented at once simply by the provision of adequate Veterinary staff and equipment.

A considerable time would elapse in some instances before the conservative native could be convinced of the efficacy of the methods employed by the Veterinary staff and it would be necessary to gain his confidence in order to obtain that close co-operation required of the veterinarian and the stock owner to ensure success.

Rinderpest.

The following outbreaks of rinderpest occurred on European-owned farms during the year:—

Naivasha District	9	outbreaks
Nakuru District	5	,,
Uasin Gishu District	36	,,
Eldama Ravine District ...	1	outbreak
Nyeri District	8	outbreaks
Kyambu District	4	,,
Kisumu District	4	,,
Lumbwa District	13	,,
TOTAL ...	80	

Ten of these outbreaks (Naivasha 9, Kyambu 1) were dealt with by "double Inoculation" i.e. the simultaneous injection of virulent blood and anti-rinderpest serum; the remainder were dealt with by the use of anti-rinderpest serum only. Double inoculations were also carried out at certain quarantine stations, on farms at Gilgil, Elmenteita, Juja, and Ulu, and throughout the Songhor, Lumbwa, Koru and Sotik Districts.

The results of the use of anti-rinderpest serum alone in dealing with outbreaks were very satisfactory where the herds were under careful supervision and the serum was used promptly. In other cases where the disease had obtained a firm hold before it was noticed the mortality was as high as 50%.

The results of the double inoculations carried out were, on the whole, satisfactory but in individual cases the losses were abnormally high. A probable explanation of some of these cases is that the blood used for inoculation lost its virulency to some extent with the result that a number of inoculated animals failed to react to the inoculation and, later, contracted infection naturally.

Several of the outbreaks which occurred on European-owned farms were traceable to diseased game, chiefly buffaloes, and most of the outbreaks in the Nyeri District due to infection from this source were of a particularly mild type. Later the disease appeared to increase in virulence and one native chief lost about 300 head of cattle. In the case of the outbreaks in the Kedong Valley where buffalo were also involved, the disease, as it affected cattle, was of the usual virulent type.

Rinderpest may be said to be widespread throughout the native reserves of the Protectorate. Owing to the heavy losses sustained in North Kavirondo District a Veterinary Assistant was detailed for duty there but little or no headway was made against the disease.

The number of cattle double inoculated on European-owned farms during the year was 8,221 and the average mortality following inoculation was 4%.

The following trade cattle were double inoculated at the undermentioned quarantine stations:—

Koru and Kibigori	...	12,126
Rumuruti ...	...	15,400
Machakos ...	...	2,089
Thika ...	...	487
TOTAL	...	30,102

The average mortality was 2.5%.

One thousand two hundred and fifty-nine head of cattle which had previously been double inoculated against rinderpest were re-inoculated with virulent blood only in order to test their immunity. The results were satisfactory.

Pleuro-Pneumonia.

At the beginning of the year Pleuro-pneumonia was known to be widespread in the Masai Reserve and its presence was suspected in the Suk and Turkana districts. On this account cattle movement was and is prohibited from these areas.

In May an outbreak was discovered in a herd of native-owned cattle near Njoro and all infected and in-contact cattle were immediately slaughtered. There is no doubt that this outbreak resulted from the illicit movement of cattle from the Masai Reserve.

In October it became evident that Pleuro-pneumonia was prevalent amongst the Suk cattle and that it was spreading rapidly in the adjoining Eastern Provinces of Uganda.

It is not definitely known whether the disease originated at an old centre in the Suk or Turkana country or was brought from the Sudan by the supply cattle of a military column but the fact remains that it spread rapidly and has caused heavy losses in the native areas. Infection spread from the Suk district to three farms in the Eldoret district where the disease was promptly stamped out by the slaughter of the infected animals and the inoculation of over 650 head of cattle. Veterinary police posts are now stationed along the Suk border with a view to the prevention of illicit cattle movement.

Towards the end of the year a serious outbreak of pleuro-pneumonia occurred at Rumuruti amongst work oxen which had been employed for some months in transporting goods from the railway station at Gilgil to various farms in the vicinity and to Laikipia. As a result of investigations carried out it was ascertained that some of the cattle had been infected for nearly three months before the presence of the disease was suspected and, at the end of March, outbreaks resulting from contact with the infected transport cattle were located on four farms in the Gilgil-Laikipia districts. Every effort is being made to trace the ramifications of the outbreak and it is feared that several more farms will be found to be infected.

So far no conclusive evidence has been forthcoming as to the origin of this outbreak as it has not been possible to trace with certainty the history of many of the cattle involved.

The measures adopted in suppressing these outbreaks comprised the isolation of the infected herds, the slaughter of all visibly infected animals and the inoculation of all in-contact cattle.

In the original outbreak 29 visibly infected cattle were destroyed, 2 others failed to react to inoculation and were later found to be infected on post mortem examination whilst nine head developed clinical symptoms at the height of the reaction and were destroyed.

The material used for inoculation in some cases has been lymph collected from the lungs and pleural cavity of a naturally infected animal, and in others it has been lymph obtained from the swelling resulting from the subcutaneous inoculation of virus behind the shoulder of a young bullock. The method of inoculation consisted in injecting subcutaneously a ½ c.c. of virus near the tip of the tail by means of a syringe and needle or inserting, at the same site, a seton of wool soaked in virus. The Veterinary Officers who carried out the inoculations appeared to prefer the seton method.

Pleuro-pneumonia was reported to be causing heavy losses during the year amongst cattle in the Bissel district in the Masai Reserve and, in December, it broke out in the Siria District—a district which had hitherto been free of the disease.

In September 1,052 head of cattle imported from Tanganyika Territory were inoculated with the virus of pleuro-pneumonia; about 2% died as the result of the inoculation and only five failed to give reactions.

East Coast Fever.

During the period under review six outbreaks of East Coast Fever occurred in areas hitherto free from the disease. Three of these outbreaks occurred bordering on the Nakuru infected area, one in West Kenya, one in the Upper Molo District and one at Rumuruti. The source of infection in the case of the Upper Molo and West Kenya outbreaks could not be traced but the Rumuruti outbreak was found to have originated in an animal which had arrived from the West Kenya district nineteen days before death occurred.

The infected farms were placed in quarantine and the cattle on them are now being dipped at 3 day intervals except in one case where spraying is being carried out pending the erection of a dipping tank.

One or two serious outbreaks occurred on farms in the infected Uasin Gishu district and, in one outbreak, two hundred head of cattle died of this disease. Reports have also been received that in some instances in spite of regular dipping, heavy losses have occurred. In many of these cases the losses are attributable to one or more of the following causes:—

(1) Failure on the owner's part to keep the dipping fluid up to correct strength.

(2) "Hand-dressing" not being carried out properly at regular intervals.

(3) Dipping tank not being cleaned out as required and refilled with fresh dipping fluid.

On a heavily infected farm dipping cannot be expected to stop the mortality at once, but if the operation is properly carried out and the cattle are carefully "hand dressed" the infection should soon be reduced to a minimum and ultimately disappear.

Unfortunately some farmers relax their precautions as soon as they have got the disease in hand and sooner or later a recrudescence occurs with serious consequences.

The attention of stock owners has frequently been drawn by this Department to the necessity for keeping careful records in connection with the dipping fluid but few appear to appreciate the importance of such records and many have only an approximate idea of the capacity of their dipping tanks. The result of

this is that, when a sample of the dipping fluid is reported by the Government Analyst as being dangerously above or below strength, the owner, in many cases, has not the necessary data to enable him to correct the strength accurately. If the necessary records were difficult to keep there would be some excuse for those who fail to possess them but the details and calculations required are so simple that the average person with an elementary knowledge of arithmetic is quite capable of recording and making them.

As examples of the results of carelessness two cases which came under notice during the year may be cited. In one case the dipping fluid was of such a strength that several cattle succumbed to arsenical poisoning after being passed through it and, in the other case, cattle were dipped at three day intervals in dipping fluid of seven day strength with disastrous results.

The losses suffered recently in the Masai Reserve from East Coast Fever are reported to have been very heavy and the Officer-in-Charge estimates that upwards of half a million deaths have occurred during the past two years from tick-borne diseases, pleuro-pneumonia and rinderpest.

Three dipping tanks have been erected in the Masai Reserve at M'bagathi, Ngong and Mara and it is intended to erect several more next year if European supervision can be provided in connection with the work of construction.

A considerable percentage of the cattle imported from Tanganyika Territory during the year proved to be susceptible to East Coast Fever when exposed to infection at the Kibigori Quarantine Station and in one mob of cattle 10% succumbed to this disease. A dipping tank has been erected at Kibigori for the use of susceptible trade stock but owing to its faulty construction, it has not been possible to utilise it yet.

Arrangements were made during the year to open Kamiti station where the immunity of cattle is tested by placing them on a highly infected area. As this station had been closed for nearly two years and destocked it was necessary to re-infect it and it was not opened to receive cattle for testing until October 20th, 1919. Since that date 427 head of cattle have been tested and branded as immune.

The number of Government dipping tanks erected or in course of erection is now 24 and the approximate number of privately owned tanks is 180.

The number of dip samples analysed at the Government Analytical Laboratory during the year was 873 representing an increase of 30% over the number analysed during the previous year.

The Government Analyst has kindly supplied the following comparative statement with regard to the analysis of dip samples for the last six years:—

Class.	Error in strength.	1914	1915	1916	1917	1918	1919
Sufficiently correct	Not exceeding 10% ...	61·4	54·5	58·8	52·9	50·1	48·2
Seriously wrong	11% to 20% ...	20·6	25·7	22·3	26·1	24·2	25·9
Dangerously wrong	Exceeding 20%	18·0	19 8	18·9	21·0	25·7	25·9

Trypanosomiasis.

Outbreaks of trypanosomiasis occurred during the year on farms in the Thika, Uasin Gishu, Nakuru, Eldama Ravine and Kericho districts. In all cases the original infection appears to have been introduced by animals which had been recently brought from "tsetse fly" areas and evidence of mechanical transmission by means of other blood sucking flies was only obtainable in two outbreaks.

A fairly heavy mortality occurred in the outbreaks in the Thika and Kericho districts and ten deaths occurred in the outbreak on the Uasin Gishu Plateau.

In the Thika outbreak the principal losses occurred in April, May and June.

Cases of this disease occurred in two oxen brought in to Thika from the Northern Frontier District; in two oxen brought into the Nakuru District from near Lake Baringo; and in one ox brought to Machakos from the Kitui District.

Foot and Mouth Disease.

Thirty-seven outbreaks of this disease were reported during the year in the following districts:—Uasin Gishu, Lumbwa, Kisumu, North Kavirondo, Eldama Ravine, Nyeri, Naivasha and Nakuru.

In the majority of these outbreaks the disease followed a mild course and the mortality was negligible but in an outbreak amongst the cattle in the Kibigori Quarantine Station 40 deaths occurred in a mob of 600 head and, in an outbreak near Nakuru, many sucking calves succumbed to the disease.

Anthrax.

During the year 15 outbreaks of Anthrax came under notice and in eight of these all in-contact animals were vaccinated against the disease with uniformly successful results.

At the beginning of the year vaccinations were carried out on farms in the Nakuru District where heavy losses had been sustained. Forty head of cattle had died prior to vaccination leaving a balance of 287 head to be dealt with. Of these, fourteen had died after the first vaccination and one died after the second vaccination. At the same time 271 head of clean cattle were vaccinated on a neighbouring farm with no mortality.

Heartwater,

A half-bred heifer died of this disease in the Lumbwa district and an outbreak occurred amongst sheep in the Gilgil District during the year. In one of these outbreaks the cattle on the farm were dipped at seven day intervals with markedly beneficial results but it is generally found that the tick which transmits this disease is very difficult to eradicate from a farm and "hand-dressing" in conjunction with dipping is necessary if any considerable diminution of the number of ticks is aimed at.

Tuberculosis.

Two cases of this disease came under notice in oxen imported from Uganda and several cases occurred amongst imported military cattle. All infected animals were slaughtered.

Contagious Abortion.

Although this disease is known to be fairly widespread throughout the herds of the Protectorate only one positive case came under notice during the year.

Colon Bacillosis.

Several cases of this condition came under notice but it was not nearly so common as in previous years. The vaccine produced at the Laboratory has given uniformly good results and several stockowners report that since using it their losses amongst calves have been negligible.

Anaplasmosis.

Very few cases of Anaplasmosis were reported amongst herds which were regularly dipped.

Redwater.

This disease usuallycomes under notice in herds infected with rinderpest and cases frequently occur after double inoculations have been carried out in a herd.

Blackquarter.

Seven outbreaks of Blackquarter were reported during the year in the Machakos, Kisumu, Nakuru and Naivasha districts. The vaccine produced at the Laboratory for use against this disease gave excellent results.

Leeches.

Heavy losses amongst cattle were reported in February on a farm near Naivasha. The owner stated that 65 head had died and when the District Veterinary Officer visited the farm he found 15 head in a dying condition. The cause of the mortality was found to be a heavy infestation of leeches. Treatment consisted in administering strong saline solutions by the nostrils and in giving sulphur inhalations. The owner was advised to select fresh watering places for his cattle and no further cases occurred.

DISEASES OF EQUINES.

Ulcerative Lymphangitis.

Ninety five horses and forty-one mules were reported to be infected with this disease during the year. When the small equine population of the Protectorate is considered it will be evident that this disease has become a greater menace than horse sickness and numerous experiments were conducted at the Laboratory with a view to evolving a line of treatment which would give satisfactory results. Unfortunately none of the methods tried proved to be specific. Treatment with vaccine gave good results in the early stages of the disease but few cures were obtained in cases of old standing.

Epizootic Lymphangitis.

Eighteen cases of Epizootic Lymphangitis came under notice. Treatment with Iodides of potassium and mercury continued to give good results.

Horse Sickness.

Upwards of 40 deaths from Horse Sickness were reported and most of these occurred in the months of May and June in the Nairobi and Lumbwa Districts.

Miscellaneous.

Three cases of Biliary Fever, one case of Anthrax, one case of Tuberculosis, one case of Tetanus and two cases of Trypanosomiasis were reported during the year.

Diseases of Sheep and Goats.

Owing to the shortage of staff and the prevalence of cattle diseases the District Veterinary Officers were unable to devote as much attention to the diseases of sheep and goats as was desirable.

The bulk of the losses suffered would appear to be due to intestinal parasites; sheep scab has in some districts been prevalent. An outbreak of heartwater and an outbreak of bluetongue came under notice in the Gilgil District.

Diseases of Pigs.

Three outbreaks of swine fever occurred—two in the Naivasha district and one on the Uasin Gishu Plateau. Apart from these three instances pig breeders would appear to have had a very successful year.

Diseases of Dogs.

Many cases of tick fever came under notice during the year and treatment with trypanblue gave the usual good results. Some cases showed rather atypical nervous symptoms. One case of Trypanosomiasis was reported.

Diseases of Poultry.

Fifteen outbreans of Kikuyu Fowl Disease came under notice and the mortality was in most cases, heavy.

Fowls can readily be immunised against this disease with a vaccine prepared at the Laboratory but some time elapses before immunity is produced and, as the disease pursues a rapid course, the results of vaccine treatment are not very satisfactory in flocks already infected. Experiments are now being conducted at the Laboratory, therefore, with a view to the production of a curative serum for use against this disease.

GENERAL.

Livestock Importations.

The Livestock importations through the ports of Kilindini and Mombasa for the years 1918-19 and 1919-20 were as follows:—

	1918-19	1919-20
Horses ...	8	84
Mules ...	51	5
Donkeys ...	383	183
Cattle ...	872	840
Camels ...	88	24
Sheep and Goats ...	1,870	2,445
Pigs ...	9	39
Poultry ...	116	339
Dogs ...	25	60
Cats ...	4	8

The number of cattle imported from the Uganda Protectorate was 329 as compared with 361 in the previous year. 1,598 head of cattle were imported from Tanganyika Territory.

Trade Stock.

The following returns show the number of trade stock dealt with at the various Quarantine Stations during the past three years:—

		1917-18	1918-19	1919-20
1.	RUMURUTI.			
	Cattle ...	6,581	10,441	15,400
	Sheep and Goats ...	1,403	12,770	15,950
	Ponies and Mules ...	450	148	490
2.	KIBIGORI.			
	Cattle ...	16,620	8,910	12,126
3.	MACHAKOS.			
	Cattle ...	—	—	12,126
4.	THIKA.			
	Cattle ...	—	—	487

MEAT INSPECTION.

The following abattoir returns have been received from Nairobi and Mombasa.

1. NAIROBI.

Cattle slaughtered ...	7,025	... Condemned	139
Sheep and Goats slaughtered	23,422	... Condemned	54
Pigs slaughtered ...	493	... Condemned	3
Total ...	30,940		196

The carcases condemned were suffering from the following diseased conditions:—

Cattle.

East Coast Fever	51
Measles (Cysticercus bovis) ...	38
Emaciation	1
Pleuro-pneumonia	47
Jaundice	2
	139

Sheep and Goats.

Pneumonia	12
Pyaemia	2
Emaciation	34
Jaundice	6
	54

Pigs.

Pleurisy and pneumonia	3

For purposes of comparison the numbers of animals slaughtered for food in Nairobi during the past three years are given below:—

	1917-18	1918-19	1919-20
Cattle ...	3,015	5,567	7,025
Sheep and Goats ...	20,194	19,930	23,422
Pigs ...	976	427	493

2. MOMBASA.

The following are the abattoir returns from Mombasa for the past three years:—

	1917-18	1918-19	1919-20
Cattle ...	2,620	3,712	3,232
Sheep and Goats ...	10,214	11,714	8,335
Camels ...	—	36	6

The Permit System.

The movement of livestock throughout the Protectorate continues to be governed by the permit system.

Complaints were received from certain districts during the year that some difficulty was experienced in obtaining the necessary permits but this grievance has been removed by considerably increasing the number of honorary permit issuers. There are at present 59 honorary permit issuers and the thanks of the Government and the community at large are due to them for having undertaken these duties. All Veterinary Inspectors also act as Issuers of Permits.

Branding of Stock Ordinance.

The following are the particulars of brands registered, transferred and cancelled during the year:—

Brands registered by Government Departments ...	8
Brands registered by private individuals	112
Brands registered by Auctioneers	5
Total ...	125

Brands transferred ...	6
Brands cancelled ...	56

The following branding irons were issued:—

To Government Departments ...	80
To private individuals	156
To the Uganda Protectorate ...	16
Total ...	252

In conclusion I should like to record my appreciation of the highly efficient manner in which the members of all branches of the staff have carried out their duties during the period under review and would state that any successes which have been achieved in combating outbreaks of disease have been largely due to the effective co-operation of the Field and Laboratory staffs.

W. KENNEDY,
Acting Chief Veterinary Officer.

Appendix C.

ANNUAL REPORT

OF THE

Veterinary Pathologist,
Division of Veterinary Pathology,
Kabete,
31st March, 1920.

The Honourable,
The Director of Agriculture,
Through
The Ag. Chief Veterinary Officer,
Nairobi.

Sir,

I have the honour to submit the following Report upon the work of this Division for the Year ending March 31st 1920.

It is regretted that it was not possible to complete the whole of the Research work outlined for the Year.

This was chiefly due to:—

(1) The absence on leave of the Assistant Veterinary Pathologist and Laboratory Superintendent.

(2) The recall of the Acting Assistant Veterinary Pathologist for Field duties.

(3) The absence on leave, in most cases considerably overdue, of the majority of the staff.

(4) The replacement of Temporary Appointments on the Clerical Staff by newly appointed Officials in accordance with the Laboratory Extension Scheme and who were not familiar with Clerical work of a technical nature.

(5) The dis-organisation of the work caused through building operations and refitting of the Laboratory.

The bulk of the Administrative as well as the routine technical work including the preparation of Sera and Vaccines had thus to receive my personal attention during a portion of the Year; little time could be spared for other duties with the result that work of an experimental nature had to suffer.

Attention could only be given to that which was of urgent importance, namely:—

(1) Rinderpest Immunisation Experiments for the purpose of determining the cause of an unusual mortality which occurred during the previous year and since then, in Cattle undergoing Rinderpest immunisation in the Practice.

(2) Pleuro-pneumonia Inoculation Experiments with the object of preparing a vaccine which would meet the requirements of the Practice. The details and results of which are recorded in this Report.

I regret to say that the existing Plant and Machinery do not meet the increased requirements; that the Laboratory fittings and installation of Laboratory equipment are far from being complete.

The work falls under the following heads, which together with the personnel, are discussed below:—

(1) Personnel.
(2) (*a*) Demonstrations to Veterinary Field Officers.
(*b*) Course of instruction to Stock Inspectors.
(3) Lectures to Ex-Soldier Settlers.
(4) Livestock.
(5) Correspondence.
(6) Laboratory Farm Work.
(7) Buildings and Land.....(*a*) Roads.
(*b*) Upkeep of Laboratory.
(8) Plant.
(9) Finance.
(10) Technical Work.....(1) Routine.
(2) Experimental.
(*a*) Outbreaks of disease investigated.
(*b*) Laboratory and field experiments.

(1). PERSONNEL.

Assistant Veterinary Pathologist. Mr. W. Kearney proceeded on leave to England on the 20th April 1919 and returned to duty on the 25th December 1919 and relieved me of the Administrative and part of the Technical Routine Work. In the absence of this Officer, Mr. T. C. Bradshaw, Veterinary Officer, carried out the duties of Assistant Veterinary Pathologist until August 1919, being then recalled for Field duties.

Research Officers.—Two vacancies under this heading have existed since October 1918. Had these two Posts been filled much more ground would have been covered during the year under review.

Laboratory Superintendent.—Mr. A. Walker proceeded on home leave in November 1919; his leave will expire on the 13th February next. The Administrative duties of a routine nature devolved in this Officer's absence on Mr. Kearney, The Assistant Veterinary Pathologist.

Clerical Staff.—Mr. L. Myers proceeded on home leave in December last. This Officer's leave will expire on the 16th October next. The existing four vacancies in our Clerical Staff were filled by the following Officers, all ex-service men, Messrs. A. R. Ballot, W. White, A. E. Johnstone and A. J. Kemp. Mr. A. R. Ballot arrived July 17th 1919. Messrs. White, Johnstone and Kemp on the 8th December 1919. The duties assigned to these Officers being as follows:—Mr. Ballot—Accountancy, Mr. White, Technical Records and Librarian, Mr. Johnstone, Technical, Mr. Kemp, Administrative. On arrival of these new Officers, Miss D. Kidson, Miss H. U. Gliemann and Miss V. Gray relinguished their temporary appointments.

Laboratory Lay Staff.—The two Senior Laboratory Assistants, Messrs. Schultz and Ford remained on duty throughout the Year. Mr. H. J. Gray reported from leave on the 21st April 1919. Mr. Goodwin, the other Junior Laboratory Assistant has remained on duty throughout the Year.

Lay Field Assistants.—Mr. T. Lloyd relinquished his appointment on the 15th March. The vacancy has been filled by Mr. P. H. Poolman. Mr. J. R. McQueen was appointed to fill the other vacant Post on June 1st 1919.

Farm Overseer.—Mr. J. Burton proceeded on home leave in October 1919. In the absence of this Officer, the duties of Overseer have been performed by Mr. A. Wight, Yard Foreman.

Yard Foreman.—On Mr. Wight taking over the duties of Farm Overseer, his place was filled temporarily by T. Lloyd, Lay Field Assistant.

Storekeeper.—Mr. J. Scott proceeded on leave to England in November 1919. This Officer's leave will expire on the 24th October 1920.

The appointment of an Assistant Storekeeper was sanctioned during the year and Mr. G. W. Clochley was accepted to the Post on September 1st, and since the Storekeeper's absence on leave, has carried out the duties of both the Storekeeper and his own Post.

Laboratory Students.—Three Studentships have remained vacant during the year.

(2) Demonstration to Veterinary Field Officers.

(*a*) Arrangements were made whereby Veterinary Field Officers on arrival on first appointment proceeded to Kabete Laboratory for a short course prior to commencing Field duties. During the year several Officers completed the course.

(*b*) Course of Instruction to Stock Inspectors.

A number of Stock Inspectors who were appointed during the Year were given a course of instruction prior to commencing duty.

(3) Lectures to Ex-Soldier Settlers.

During the month of January, 1920, eight lectures and demonstrations on Veterinary Science were delivered to ex-soldier Settlers on their arrival in the Colony. There was a good attendance on each occasion and much keenness was shown in following the lectures . . . . . Mr. Kearney, the Assistant Veterinary Pathologist, assisted.

(4).—LIVESTOCK.

Species	On Books 31-3-19	Received during year	Total for year	Remaining on Books 31-3-20
Horses ...	23	68	91	18
Mules ...	46	58	104	65
Donkeys ...	1	—	1	—
Cattle ...	732	1,121	1,853	1,017
Sheep ...	105	85	190	98
Goats ...	2	5	7	6
Pigs ...	26	16	42	16
	935	1,353	2,288	1,220

(5).—CORRESPONDENCE.

During the Year 2,496 Inward and 2, 244 Outward letters and Telegrams have been dealt with, a total of 4,740. The correspondence included a considerable number of Reports of a technical nature which had to receive my personal attention.

(6).—LABORATORY FARM WORK.

Throughout the year normal conditions prevailed. Average crops have been produced; entailing the ordinary routine work of the Farm, which has, however, been severely hampered by the necessity to cut down our labour to the smallest possible margin.

CROPS GROWN.

PLOT.

1. Mangolds.
2. Rape.
3. Maize.
4. Maize.
5. Maize.
6. Carrots.
7. Maize.

A. Carrots.
B. Mangolds.
C. Lucerne.
D. Maize.
E. New Land broken up.

The total land under cultivation being 120 acres. Approximately 300 tons of Ensilage has been prepared and proved a great asset throughout the Year.

It is to be regretted that the acreage at our disposal is totally inadequate, necessitating the purchase of large quantities of Maize and other Foodtuffs from outside sources.

A cattle Dipping Tank has been erected for the Laboratory Farm Stock.

(7).—BUILDINGS AND LAND.

Laboratory Extension.—Regarding the Laboratory Extension Scheme commenced in October 1918.

The second storey over the existing front block has been completed; this Storey consists of three rooms facing due south; the central room has been converted into a Library and Lecture room; another of the remaining two, into a General Office for the Clerical Staff; the remaining room is to be equipped for Museum purposes.

The new back wing on the right hand side has been completed and partially occupied.

Housing.—The Hostel has been completed and a portion of the building has been occupied as Quarters by two Members of the Staff.

The existing accommodation is now quite inadequate to house the increased Staff and it is hoped that Funds for the continuance of the extension scheme may be available in the near future.

(a).—ROADS.

The question of repair and maintenance of Roads is one of extreme urgency, in as much as in the rainy seasons our road transport is almost at a stand-still, owing to the bad state of the main road between the Laboratory and Nairobi; as a result, much expenditure has been involved in Rail Freights on Material which our Mule Transport could have coped with.

A new alignment has been commenced at Mile 332.9¾ which will open up a much shorter route to Nairobi.

(b).—UPKEEP OF LABORATORY.

During the year under review, the work of repair and maintenance at the Laboratory has unfortunately not received the attention it calls for; this has been the result of the great difficulty in securing the services of competent artizans, consequently depreciation has been accelerated, more especially in the early months of the present rainy season, when leakages occurred in the roofs of practically all the Laboratory Buildings, causing much deterioration to New Works and Laboratory appliances.

The same neglectful appearance is presented by many of the fences, doors and gates in the Laboratory paddocks and bomas.

Much, therefore, remains to be done in this direction immediately facilities become available.

(8).—PLANT.

The whole of the Laboratory plant is in a very bad state of repair, owing to the fact that repairs have not been carried out at regular intervals; the result has been a heavy all-round depreciation and thorough renovation is essential before satisfactory results can be looked for. Electrical appliances have remained idle throughout the year simply because there has not been sufficient power available from the small plant at our disposal. It is hoped, however, that the plant will be renovated in a manner which will enable us to make use of our Photomicrographic apparatus; install the Electric Incubator which is lying at present in our Store, and furnish the Laboratory with satisfactory lighting facilities.

(9).—FINANCE.

The expenditure Vote for the Pathological Division for the year 1919-20 was £16,213 an increase of £2 240 over the previous year; of this amount, £6,003 was for Personal Emoluments, £3,000 for the production of Anti Rinderpest Serum for other Governments and the balance for the general upkeep of Laboratory, Purchase of Apparatus, Machinery, Animals, etc.

The total revenue derived from the issue of Laboratory products issued during the year amount to £12,534. This does not include revenue derived from the issue of Anti Rinderpest Serum for double inoculations in this Colony, such revenue appearing in the Veterinary Division Books under "Testing, Dipping Fees, etc."

SERA AND VACCINES.

Summary of Sales—Year 1919-20.

Total Revenue ... Rupees 188,021.08 = £12,534 14s.

Sera and Vaccines.

Anti Rinderpest Serum ...	Rupees	184,996	08	£12,333	1	4
Various Vaccines ...	Rupees	2,678	50	178	10	
Trypanblue	Rupees	346	50	23	1	11
	Rs.	188,021	08	£12,534	14	

Revenue—Rinderpest Serum—1919-1920.

Uganda	Rupees	84,122	...	£5,608	2	9
Belgian Congo	,,	27,857	...	1,857	2	5
Constantinople	,,	12,760	...	850	13	8
Mesopotamia	,,	12,500	...	833	6	6
Egypt	,,	12,540	...	836	0	0
Tanganyika Territory ...	,,	10,260	...	684	0	0
Palestine	,,	5,310	...	354	0	0
Locally	,,	19,647	08	1,309	16	0
	Rupees	184,996	08	£12,333	1	4

(10).—TECHNICAL WORK OF THE YEAR.

1.—Routine.

(*a*). Examination.—A total number of 2,771 Slides and Specimens received from Government Officials and Stock Owners were examined and reported on during the year.

The following is a classification of the diagnosis arrived at:—

CATTLE.—Total Examined		2,090
East Coast Fever	444	
East Coast Fever and Redwater ...	6	
Bacillary Necrosis	8	
Redwater	50	
Trypanosomiasis	53	
Tuberculosis	7	
Anaplasmosis	12	
Anthrax	25	
Small Piroplasms	115	
Suspicious East Coast Fever	29	
Redwater with P. mutans	27	
Necrosis of Larynx	1	
Streptothricosis	2	
Contagious abortion	1	
Enteritis	1	
Gastritis	1	
Haematuria	1	
Anaemia	3	
Arsenical poisoning	2	
Anisocytosis	4	
Suspicious Blackquarter	1	
Blackquarter	8	
Pneumonia with bacterial infection ...	2	
Trypanosomiasis with East Coast Fever ...	1	
Acute hyperaemia and Oedema of Lungs ...	2	
Redwater with Anaplasmosis	1	
Anaplasmosis, Redwater with P. mutans ...	1	
Tick Specimens	1	
Worm Specimens	1	
Worm infection	1	
Sent to Analyst	1	
Not examined	30	
Negative	1,247	
Awaiting diagnosis	1	
HORSES.—Total Examined		301
Ulcerative Lymphangitis	116	
Suspicious Ulcerative Lymphangitis ...	9	
Epizootic Lymphangitis	15	
Trypanosomiasis	2	
Biliary Fever	3	
Ulcerative with Epizootic Lymphangitis ...	1	
Suspicious Epizootic Lymphangitis ...	1	
Specimen awaiting diagnosis	1	
Specimens kept for Experiment ...	3	
Cocci and Bacillary Infection	3	
Negatives	147	

MULES.—Total Examined		135
Ulcerative Lymphangitis	49	
Epizootic Lymphangitis	30	
Ulcerative and Epizootic Lymphangitis ...	1	
Suspicious Ulcerative Lymphangitis ...	2	
Trypanosomiasis	1	
Streptothricosis	1	
Anthrax	3	
Negatives	48	
DONKEYS.—Total Examined		20
Suspicious Ulcerative Lymphangitis ...	1	
Piroplasma	3	
Spirochaetosis	1	
Negatives	15	
SHEEP.—Total Examined		34
Necrotic abscess	1	
Ticks, unidentified	1	
Ticks (Amblyoma Variegatum)	1	
Too decomposed for diagnosis	3	
Negative	28	
DOGS.—Total Examined		76
Tick Fever	25	
Anaemia	10	
Trypanosomiasis	1	
Negative	40	
PIGS.—Total Examined		19
Pleurisy with Peritonitis	1	
Anthrax	1	
Gastritis	1	
Swine Fever	1	
Negatives	14	
Awaiting diagnosis	1	
FOWLS.—Total Examined		65
Kikuyu Fowl Disease	37	
Tuberculosis	1	
Poverty	2	
Egg Bound	2	
Peritonitis	2	
Parasitic infection	1	
Negatives	20	
DUCKS.—Total Examined		2
Poverty	1	
Negative	1	

TURKEYS.—Total Examined		12
Kikuyu Fowl Disease	7	
Sarcoma of liver	1	
Sarcoma	1	
Egg Bound	1	
Awaiting Histological Examination ...	1	
Negatives	1	
GUINEA PIGS.—Total Examined		4
Congestion of lungs	4	
BUCK.—Total Examined		1
Worms	1	
GOATS.—Total Examined		1
Negative	1	
PIGEONS.—Total Examined		1
Negative	1	
FLIES.—Total Examined		5
Tabanus Taeniola	1	
Haematopota	2	
Sent to Entomologist	2	
WORMS.—Total Examined		3
Amphistoma	2	
Distoma	1	
PLANTS.—Total Examined		1
Sent to Mycologist	1	
SPECIMENS with no particulars		2

PREPARATION AND ISSUE OF SERA AND VACCINES.

The following Table shews the Laboratory Products prepared and issued during the Year:—

Anti Rinderpest Serum.

	Doses.
Balance on hand 31-3-19	297,391
Returned to Stores	40,741
Manufactured during the Year	235,617
Total	573,749

				Doses.
Issues to Departmental and Administrative Officers				164,652
Stock Owners	...	...	...	34,738
Other Countries	...	...	...	266,871
Written off	...	...	...	14,292
Balance on hand 31-3-20	...	...	...	93,196
	Total	...	...	573,749

Colon Bacillosis Vaccine.

				Doses.
Balance on hand 31-3-19	...	...	...	335
Manufactured during Year	...	...	...	5,247
	Total	...	...	5,582

				Doses.
Issued during year	...	...	...	5,970
Balance on hand 31-3-20	...	...	...	437
	Total	...	...	5,582

Blackquarter Vaccine (Single).

				Doses.
Balance on hand 31-3-19	...	...	...	4,360
Manufactured during year	...	...	...	—
	Total	...	...	4,360

				Doses.
Issued during year	...	...	...	—
Balance on hand 31-3-20	...	...	...	4,360
	Total	...	...	4,360

Ulcerative Lymphangitis Vaccine.

				Doses.
Balance on hand 31-3-19	...	...	...	1,500
Manufactured during year	...	...	...	4,525
				6,025
Issued during year	...	...	...	5,970
Balance on hand 31-3-20	...	...	...	55
				6,025

Blackquarter Vaccine (Double).

1st Vaccine.

	Doses.
Balance on hand 31-3-19	70
Returned to Stores	1,490
Manufactured during year	6,820
Total	8,380

	Doses.
Issued during year	7,080
Balance on hand 31-3-20	8,300
Total	8,380

Blackquarter Vaccine (Double).

2nd. Vaccine.

	Doses.
Balance on hand 31-3-19	1,350
Returned to Stores	1,490
Manufactured during year	5,540
Total	8,380

	Doses.
Issued during year	7,080
Balance on hand 31-3-20	1,300
Total	8,380

Bovine Trypanblue.

	Doses.
Balance on hand 31-3-19	30
Manufactured during year	400
Total	430

	Doses.
Issued during year	428
Balance on hand 31-3-20	2
Total	430

Canine Trypanblue.

		Doses.
Balance on hand 31-3-19	... ...	351
Manufactured during year	... ...	304
	Total	655
Issued during year ...	... ...	433
Balance on hand 31-3-20	... ...	222
	Total	655

Wireworm Powders.

		Doses.
Balance on hand 31-3-19	... ...	340
Manufactured during year	... ...	——
	Total	340
		Doses.
Issued during year ...	... ...	——
Balance on hand 31-3-20	... ...	340
	Total	340

Kikuyu Fowl Disease.

		Doses.
Balance on hand 31-3-19	... ...	——
Manufactured during year	... ...	10,905
	Total	10,905
		Doses.
Issued during year	... ...	10,905
Balance on hand 31-3-20	... ...	——
	Total	10,905

Anthrax Vaccine (Double).

1st Vaccine.

		Doses.
Balance on hand 31-3-19	... ...	8,680
Returned to Stores	... ...	840
Manufactured during year	... ...	8,340
	Total	17,860

	Doses.
Issued during year	6,430
Destroyed by order of the V.P.	2,600
Balance on hand 31-3-20	8,830
Total	17,860

Anthrax Vaccine (*Double*).

2ND VACCINE.

	Doses.
Balance on hand 31-3-19	7,960
Returned to Stores	840
Manufactured during year	10,400
Total	19,200

	Doses.
Issued during year	5,750
Destroyed by order of the V.P.	3,120
Balance on hand 31-3-20	10,330
Total	19,200

Pleuro-pneumonia Vaccine.

	Doses.
Balance on hand 31-3-19	——
Manufactured during year	3,638
Total	3,638

	Doses.
Issued during year	3,638
Balance on hand 31-3-20	——
Total	3,638

With the re-organisation of Staff, certain temporary dislocation in work was unavoidable and it affords me great pleasure to place on record the hearty co-operation of all Members of the Laboratory Staff in the execution of their duties throughout a very trying period.

2.—Experimental Work.

(a).—Outbreaks Investigated.

(1).—Heartwater.

In September 1919, the cause of a serious mortality which was occurring in Sheep on an Estate in the Elmenteita Area was investigated. From the particulars furnished, the outbreak had commenced some weeks previously whereupon the flock was moved to the Laikipia Area where fresh cases occurred; the flock was moved back to Elmenteita in August where cases were of daily occurrence. The symptoms and post-mortem appearances pointed to Heartwater being responsible and it was decided to carry out some transmisssion experiments for the purpose of confirming or otherwise the diagnosis.

In order to overcome the difficulties usually met with in obtaining suitable material for Heartwater transmission experiments, viz., the collecting of blood from an affected animal during the temperature reaction and the inoculation of blood prior to losing its virulency, arrangements were made to truck some susceptible cattle and sheep from the Laboratory to the Estate.

These animals were kept in trucks after arrival there and until a case occurred when blood was collected with which they were inoculated; they were subsequently railed back to the Laboratory for observation.

On 16-9-19, one of the flock was noticed sick and shewing the following symptoms, viz.:—

> "Animal markedly distressed. Respirations markedly increased, (panting)—Mouth open. Temperature, 106.2° F. Reflex movements of lips and tongue. Frequent micturition or attempts to micturate. (This latter symptom was also observed in an experimentally produced case at the Laboratory). When disturbed and made to move, animal falls and remains down for some minutes, convulsive movements marked."

Blood was collected from this animal (Laboratory No. 2045) and inoculated within an hour to the above-mentioned susceptible cattle and sheep on the trucks.

The following is a summary of the results of the transmission experiments:—

(1) Blood of Sheep (No. 2045) produced Heartwater in 6 susceptible Sheep.

(2) 5 of the above-mentioned Sheep survived, the remaining animal died of Heartwater.

(3) Blood of Sheep (No. 2045) produced Heartwater in each of the 2 inoculated Cattle, viz., Nos. 4663 and 4763 (both survived).

(4) Blood collected from C. 4663 at the height of the temperature reaction and inoculated to susceptible Sheep produced Heartwater.

Features of the experiment were:—

(1) The number of the Sheep which re-acted to Heartwater and recovered.

(2) The mild reactions and subsequent recovery which occurred in the majority of the bovines, which would seem to indicate that the strain was not one of marked virulency.

The number of spontaneous recoveries in naturally infected animals which occurred on the Estate would support this.

(2).—Bluetongue.

In July 1919, the writer investigated the cause of a mortality in Sheep which was occurring on two estates, viz., S. and W. respectively, in the Gilgil area. On the former estate, the number affected was about 100 whilst on the latter—of the flock of approximately 14,000, about 800 had been visibly affected; the mortality being 360 head.

No acute cases were found on Estate S. at the time of visit, but a number of cases which were recovering, were examined.

The symptoms observed were:—

"Loss of condition. Anaemia. In some instances, loss of wool and excoriations of mucous membranes of the tongue and cheek."

The symptoms pointed to Bluetongue being the cause.

On visiting Estate "W", a number of cases shewing typical symptoms of Bluetongue were found. An affected animal was railed to the Laboratory, blood from which was collected and utilised for transmission experiments with the result that the diagnosis was confirmed.

Tuberculosis in Cattle.

In the early part of 1919, the presence of Tuberculosis was detected in a mob of cattle which had arrived at the Laboratory from Ankole, Uganda.

It was decided to test all Uganda Cattle on the Station as well as other cattle which had been in contact.

A supply of Tuberculin was ordered from London and on its arrival, the above-mentioned animals were put in Tuberculin Test, with the following results:—

Cattle Breed.	Total Number Tested.	Reacted.	Diagnosis *confirmed Microscopically.	Diagnosis not *confirmed Microscopically.	Total.
Uganda ...	167	27	23	4	27
Grade ...	52	3	2	1	3
Native ...	143	9	4	5	9

All reactors were destroyed.

(b).—Laboratory and Field Experiments.

(1). SOME OBSERVATIONS IN CONNECTION WITH RINDERPEST IMMUNISATION.

In February 1919, the writer investigated the cause of an unusual mortality which occurred amongst cattle undergoing Rinderpest immunisation (simultaneous method).

The result is recorded in the Annual Report of the Veterinary Pathologist, British East Africa Protectorate, for the year ending March 1919.

It was found that,

(1). The heaviest mortality occurred amongst cattle (chiefly young stock) born and reared on farms on which Rinderpest had neither been operating nor immunisation been resorted to during the previous 3 years or so.

It was recognised that the herds on these farms contained a large percentage of susceptible cattle but this alone did not afford sufficient explanation for the mortality which, in some cases, amounted to 34%.

(2). Whilst, in some cases, Rinderpest was responsible for death, in other, the co-existence of Redwater or Anaplasmosis and P. mutans infection—the result of either a recent infection—or a breakdown in immunity was confirmed microscopically both in dipped and undipped stock.

(3). On one Estate, fresh cases of Rinderpest and deaths from Rinderpest were occurring at a time when the evolution of the disease should have been complete, viz., from the 19th up till the 39th day after inoculation.

(4). Cattle which had been inoculated when sucking calves but which had not been re-inoculated since weaning, were contracting Rinderpest by contact from re-acting animals.

(5). A lessened resistance due to the effects of prolonged adverse climatic conditions (drought) had to be taken into consideration as a contributory cause of death, in some cases.

In 1919, the writer undertook the supervision of the preparation of Anti Rinderpest Serum and an opportunity was afforded, when testing the various Brews on their Potency, of determining,

(1). Whether an increased dose of Serum should be recommended for use.

(2). Whether the inoculation of blood collected some hours previously is responsible for non-reactions which were sometimes observed to occur in the practice.

Observations were also made in connection with,

(3). The immunisation of Calves.

(4). The "serum alone treatment" of susceptible cattle.

(1).—Whether an Increased Dose of Serum should be recommended.

Taking into consideration the number of deaths which occurred from Rinderpest in animals undergoing immunisation it seemed that the average dose of serum which was used, viz, 15 c.c's. per 100 kilos body weight, did not possibly provide for a "*sufficient margin of safety*" and it was decided to compare the results of inoculation of susceptible Cattle with serum at the rate of 15, 30 and 45 c.c's., respectively, per 100 kilos body weight.

The cattle utilised for the Tests were either susceptible Uganda or Grade animals. The dose of serum (estimated by weighing the animals) was inoculated subcutaneously on one side and 2 c.c.'s fresh virulent blood on the opposite side of the body. The cattle were housed at night and allowed to graze during the day.

The temperature was taken daily in the morning's only.

Blood smears were collected, at least, once during the reaction and the result of examination recorded.

The majority of the cattle were tested on their immunity, in most cases, on the 14th day after inoculation.

The blood used for the experiments was collected, usually on the 3rd day of the temperature reaction, from animals which had been inoculated with virulent blood and which were as a result, reacting to Rinderpest and used within, at the latest, an hour after collection.

Summary of Results of the Serum Potency Tests.

(1). A total of 240 cattle (61 Grade and 179 Uganda) were inoculated with Fresh Virulent Blood and varying doses of Anti Rinderpest Serum (15, 30 and 45 c.c.'s, per 100 kilos).

(2) All reacted to Rinderpest with the exception of three, which, when tested on their immunity, were found to be refractory.

(3). With a few exceptions, the survivors were tested on their immunity and found to have acquired immunity.

(4). Increased doses of Anti Rinderpest Serum produced a notable decrease of mortality.

(5). A higher death rate generally occurred in poor condition than in good or fair condition cattle.

(6). A still markedly higher death rate occurred in poor condition cattle exposed to rain whilst undergoing immunisation treatment and sometimes in good or fair conditioned cattle.

(7). (*a*) Blood smears collected, at least, once during the reaction shewed, with few exceptions, some P. mutans parasites but their presence, with few exceptions, did not appear to produce pathogenic effects of any importance.

(*b*). P. bigeminum parasites were observed in 4.5% of the blood smears collected from animals during immunisation treatment.

In one instance, this infection was considered to be a contributory cause of death.

(*c*). The P. mutans and P. bigeminum parasites were observed in cattle which had recovered from these infections; the reaction to Rinderpest being responsible for their recurrence.

(2).—Experiments to determine the cause of the non-reactions to Rinderpest in inoculated Cattle.

The results of the foregoing exepriments shewed that susceptible animals inoculated with Fresh Virulent Blood and Anti Rinderpest Serum at the rate of 15, 30 and 45 c.cs., respectively, per 100 kilos, body weight, reacted to Rinderpest and were found to be immune when tested on their immunity, but since, as stated above, instances had occurred and similar results had also, on other occasions been observed by the Veterinary Field Staff during Rinderpest immunisation operations in the field when some of the cattle of a herd which had been inoculated with varying doses of Anti Rinderpest Serum, viz., 15 and 30 c.cs., respectively, per 100 kilos body weight and 2 c.cs. Virulent Blood collected some hours previously (approximately 30 hours) did not react until the 3rd or 4th week after inoculation (others of the herd having reacted within the usual period) it was decided to ascertain whether the cause of the non-reactions was the result of a

(1) decrease of virulency of the blood alone, or

(2) whether the dose of serum employed was also partly responsible.

(3) The susceptibility of the animal itself also entered into consideration.

The outline of the experiments was as follows:—

The cattle were kept in separate lots.

Lot 1.—Cattle inoculated with (*a*) Fresh Virulent Blood (*b*) 30 hours old and (*c*) 40 hours old blood of the same bleeding, respectively.

Lot 2.—Cattle inoculated with Fresh Virulent Blood and varying doses of serum, respectively.

Lot 3.—Cattle inoculated with 30 hours old blood and varying doses of serum, respectively.

Lot 4.—Cattle inoculated with 40 hours old blood and varying doses of serum, respectively.

Each lot was housed and kept under close observation. Morning and Evening temperatures were taken and recorded. Blood smears were collected on various occasions, at least once during the febrile stage and the result of the examination recorded. Surviving animals were tested on their immunity usually on the 14th day after inoculation.

The Virulent Blood was collected usually on the 3rd day of the temperature reaction from an animal reacting to Rinderpest and used either Fresh or kept at ordinary room temperature for 30 or 40 hours before use.

A different brew of serum was used for each experiment.

Summary of results of Experiments to determine the cause of Non-Reactions.

(1) The inoculation of susceptible cattle with Citrated Fresh Virulent Blood, 30 hours and 40 hours old blood, respectively, of the same bleeding collected on the 3rd day of the temperature reaction from an animal reacting to Rinderpest produced a reaction to Rinderpest.

(2) The inoculation of susceptible cattle with Citrated Fresh Virulent Blood and varying rates of Anti Rinderpest Serum (15, to 30 c.cs., per 100 kilos) produced a reaction and immunity to Rinderpest.

(3) The inoculation of susceptible cattle with Citrated Virulent Blood kept at room temperature for 30 hours and varying rates of Anti Rinderpest Serum (15 to 30 c.cs. per 100 kilos) did not always produce a reaction to Rinderpest.

Some of the animals which failed to react contracted Rinderpest by contact from the reacting animals, whilst others which did not react when tested on their immunity were found to be susceptible.

(4) The inoculation of susceptible cattle with Citrated Virulent Blood kept at room temperature for 40 hours and varying rates of Anti Rinderpest Serum, did not always produce a reaction to Rinderpest.

Some of the animals which failed to react contracted Rinderpest by contact from the reacting animals, whilst others which did not react when tested on their immunity were found to be susceptible.

The inoculation of Unweaned Calves.

The experiments included the following:—

(1) The inoculation of unweaned calves, the progeny of (*a*) immune, (*b*) susceptible parents, with Fresh Virulent Blood.

(2) The inoculation of unweaned calves, the progeny of immune parents, with fresh virulent blood and Anti Rinderpest Serum at the rate of 15, 30 and 45 c.c.'s per 100 kilos, respectively.

(3) The inoculation of unweaned calves, the progeny of immune parents with (*a*) fresh virulent blood (*b*) 30 hours and 40 hours old blood, respectively, and Anti Rinderpest Serum at the rate of 15 and 30 c.cs. per 100 kilos, respectively.

(4) The inoculation of unweaned calves, the progeny of immune mothers (Field experiment) with 27 hours old blood and Anti Rinderpest Serum at the rate of 15 and 30 c.c.'s per 100 kilos.

(5) The re-inoculation of weaned cattle which were originally double inoculated prior to weaning.

In 1918 (November) an experiment was carried out by Mr. Kearney, Assistant to the Veterinary Pathologist, for the purpose of determining the effect of the subcutaneous inoculation of unweaned calves with virulent blood only.

SUMMARY OF RESULTS OF INOCULATION OF UNWEANED CALVES WITH FRESH VIRULENT BLOOD.

1. The subcutaneous inoculation of unweaned Grade Calves (which had not been in contact with Rinderpest since birth) with Virulent Rinderpest Blood, resulted as follows:—

Unweaned Grade Calves, progeny of Immune Parents Total 20			
Died of Rinderpest	Total 3	(2 under six months (1 over six months	15%
Reacted to Rinderpest and recovered	,, 4	(2 under five months (2 over six months	20%
No apparent reaction to Rinderpest	,, 11	(9 under five months (2 over six months	55%
Doubtful temperature reaction but no visible symptoms	,, 2	Under one month	10%
	Total 20		100%

2. The subcutaneous inoculation of unweaned Calves, (Uganda) (which had not been in contact with Rinderpest since birth) the progeny of susceptible Uganda mothers with virulent rinderpest blood, resulted as follows:—

Unweaned (Uganda) Calves ...	...	... Total 7
Died of Rinderpest	Total 6	85%
Died of Redwater	,, 1	15%
	Total 7	100%

Summary of Results of Inoculation of Unweaned Calves, with Fresh Virulent Blood and Anti-Rinderpest Serum at the rate of 15, 30 and 45 c.c.'s, per 100 kilos, respectively.

Unweaned Calves born of Immune Parents,

Of 4 unweaned calves varying in age from 6 months to 9 months,

inoculated with fresh virulent blood and anti-Rinderpest serum at the rate of 15 c.c.'s, per 100 kilos,

3 gave a temperature reaction but no visible symptoms of rinderpest	75%
1 gave a doubtful temperature reaction but no visible symptoms of Rinderpest	25%

Of 2 unweaned calves varying in age from 6 - 7 weeks,

inoculated with Fresh virulent blood and Anti Rinderepst serum at the rate of 15 c.cs. per 100 kilos,

1 gave a doubtful temperature reaction and slight symptoms of rinderpest	50%
1 gave a doubtful temperature reaction only ...	50%

Of 4 unweaned Calves varying in age from 6 months to 8½ months.

inoculated with fresh virulent blood and Anti Rinderpest serum at the rate of 30 c.cs. per 100 kilos,

2 reacted; 1 temperature (1 temperature and clinically)	50%
1 gave a doubtful reaction only	25%
1 did not give a temperature or clinical reaction...	25%

Of 2 unweaned calves varying in age from 6 to 7 weeks

inoculated with fresh virulent blood and Anti Rinderpest serum at the rate of 30 c.cs. per 100 kilos.

1 gave a doubtful temperature reaction ...	50%
1 did not react	50%

Of 3 unweaned calves varying in age from 3½-6½ months. inoculated with fresh virulent blood and Anti Rinderpest serum at the rate of 45 c.cs. per 100 kilos.

2 gave a doubtful temperature reaction	...	66%
1 gave a temperature reaction	... ...	33%

Of unweaned calves varying in age from 6 - 8 weeks. inoculated with fresh virulent blood and Anti Rinderpest serum at the rate of 45 c.cs. per 100 kilos.

1 did not react	... ...	33%
2 gave a doubtful temperature reaction	...	66%

A 6 weeks old calf inoculated with fresh virulent blood only gave a doubtful temperature reaction.

Some animals in experiment were tested on their immunity on the 14th day after date of original inoculation and again on the 84th day after inoculation with negative results.

Others were tested on their immunity on the 34th day after date of original inoculation with negative results.

Summary of Results of Inoculation of Unweaned Calves the progeny of immune parents with, (a) Fresh Virulent Blood, (b) 30 hours and (c) 40 hours old blood respectively and Anti Rinderpest Serum at the rate of 15 and 30 c.c. per 100 kilos respectively.

The inoculation of 3 unweaned calves, ages from 6½ - 8 months with fresh virulent blood, 30 hours and 40 hours old blood, respectively, of the same bleeding produced a reaction to rinderpest = 100%.

The inoculation of 3 unweaned calves, ages 5½ - 6½ months with fresh virulent blood, 30 hours and 40 hours old blood, respectively, and A.R.S. at the rate of 15 c.c. per 100 kilos, produced a reaction with the 40 hours old blood = 33%.

The two non-reactors did not react when tested on their immunity.

The inoculation of 2 unweaned calves, ages 5½ - 7½ months with fresh virulent blood and 30 hours old blood respectively, and A.R.S. at the rate of 30 c.c. per 100 kilos produced reactions = 100%.

The inoculation of an unweaned calf, age 7¼ months with 40 hours old blood and A.R.S. at the rate of 30 c.c. produced a reaction to rinderpest.

The inoculation of 30 hours old blood exposed for half an hour in the sun at 92°F. produced a reaction to rinderpest in a 7½ months old unweaned calf.

The Inoculation of Unweaned Calves born of Immune Parents with 27 hours old blood and Anti Rinderpest Serum at the rate of 15 and 30 c.c. per 100 kilos.

For t is experiment Lord Delamere kindly placed at our disposal a total of 60 grade calves, ranging in age from one month to 6 months. Of these, 30 varying in age from 1 - 6 months were inoculated with 2 c.c. virulent blood and Anti Rinderpest serum at the rate of 15 c.c. per 100 kilos.

The remaining 30, varying in age from 1 - 6 months were inoculated each with 2 c.c. virulent blood and Anti Rinderpest serum at the rate of 30 c.c. per 100 kilos.

Each calf was weighed to estimate the correct dose of serum.

The animals were put on morning temperature only and were allowed to run during the day, being housed at night.

The survivors were re-inoculated with 2 c.c. virulent blood on the 14th day after the date of the original inoculation.

Summary of Results of Inoculation of Unweaned Calves with 27 hours old blood and Anti Rinderpest Serum at the rate of 15 and 30 c.c. respectively per 100 kilos.

Percentage of reactions at 15 c.c. per 100 kilos .... 33.3% approx.
Percentage of reactions at 30 c.c. per 100 kilos ... 33.3% approx.
Mortality at 15 c.c. per 100 kilos 7.5%
Mortality at 30 c.c. per 100 kilos 0%

In one case, a temperature reaction to rinderpest occurred from the 13th-16th day, infection having been contracted by contact.

Rinderpest was complicated with Redwater in both calves which died.

Surv.ving animals when tested on their immunity on the 15th day, after inoculation, did not react to Rinderpest.

Re-inoculation of Young Cattle which had been previously Inoculated when Unweaned Calves varying in age from 1—6 months.

A total of 12 cattle were kindly supplied by Lord Delamere. Each animal had been double inoculated about 12 months previously and was re-inoculated on the present occasion with 2 c.c. virulent blood and Anti Rinderpest serum at the rate of 30 c.c. per 100 kilos.

Laboratory blood was used about 27 hours after collection. Temperature of control when bled 106°F.

Animals were not weighed to estimate the weight (weight estimated from appearance). Each animal was put on morning temperature and allowed to run during the day.

The following is a summary of results:—

6 reacted to rinderpest as result of inoculation.

4 shewed no visible symptoms or temperature reaction (immune).

2 reaction commenced on the 9th and 14th day respectively, in both instances, Rinderpest having been contracted by contact from the reacting animals.

12 ... Total.

Observations in connection with Serum alone Inoculations (Single Inoculation).

In 1919, a total of 21 Cape Cattle were put in experiment at the Laboratory, Kabete, by T. C. Bradshaw, Veterinary Officer, whilst acting as Assistant to the Veterinary Pathologist.

These animals originally belonged to the Military and were handed over as Tuberculin reactors.

They were kept stabled in a building in the Boma; in the latter, cases of Rinderpest always existed for use in connection with the prearption of Anti Rinderpest Serum.

There were no actual cases of Rinderpest existing in the Stable, but the Native attendants and others had access thereto and it was quite possible for the Rinderpest to be conveyed by them.

A day or two after arrival each animal was injected with 100 c.c. of Anti Rinderpest Serum and re-injected at intervals. In some instances, when a temperature reaction to Rinderpest commenced, animals were given large doses (1,000 c.c.) whilst others were not so treated.

The average live weight of these animals was approximately 400 kilos.

The animals which were weighed varied from 335 to 435 kilos..

Summary of Serum Alone Treatment (Cape Cattle).

EXPERIMENT No. 1 OF 24.3.19.

Of 21 susceptible cattle put under serum treatment on the 24.3.19, and kept stabled since then in a Boma in which Rinderpest existed, but not in immediate contact:

1	contracted	Rinderpest	on the	12th day.
1	,,	,,	,,	21st ,,
1	,,	,,	,,	22nd ,,
1	,,	,,	,,	23rd ,,
1	,,	,,	,,	27th ,,
1	,,	,,	,,	29th ,,
1	,,	,,	,,	41st ,,
1	,,	,,	,,	48th ,,
4	,,	,,	,,	49th ,,
1	,,	,,	,,	50th ,,
1	,,	,,	,,	51st ,,
1	,,	,,	,,	52nd ,,
1	,,	,,	,,	54th ,,
1	,,	,,	,,	58th ,,
1	,,	,,	,,	61st ,,
1	,,	,,	,,	62nd ,,
1	was destroyed on the day after being put in Experiment.			
1	did not contract Rinderpest.			
21	... Total.			

Of the 19 which contracted Rinderpest, 10 RECOVERED = 52% APPROX. of these, 8 were treated with large doses of serum in the early phase of the disease; 2 were not.

9 DIED OF RINDERPEST = 47% APPROX: of these, 8 were not treated with large doses of rinderpest serum, the remaining animal was, and died of rinderpest complicated with Redwater and septic metritis (Abortion).

A breakdown in immunity to Redwater was noted in two of the animals which contracted Rinderpest, and in one animal which did not contract Rinderpest but died from Pericarditis caused by wire.

EXPERIMENT 2 OF 12.7.19 AND 18.7.19.

For the purpose of this Experiment:

9 SUSCEPTIBLE GRADE and

9 SUSCEPTIBLE UGANDA CATTLE WERE SELECTED.

Each animal was weighed separately: 3 of each lot were inoculated with 7.5 c.cs. per 100 kilos, 3 with 15 c.cs., and 3 with 22.5 c.cs. per 100 kilos, and from the date of inoculation were put in immediate contact, in an open shed, with infected animals.

They were re-inoculated at intervals.

All contracted Rinderpest: all recovered with the exception of 1 Uganda, which was inoculated at the lower rate, viz:—

7.5 c.c.'s per 100 kilos.

Summary of Results of Serum Alone Inoculations (Single Inoculation).

ANIMALS IN IMMEDIATE CONTACT WITH INFECTED ANIMALS.

GRADE CATTLE.

Of 9 cattle inoculated at intervals of a fortnight with varying doses of serum, viz: 3 with 7.5 c.c.; 3 with 15 c.c., and 3 with 22.5 c.c. per 100 kilos.

1	contracted	Rinderpest	on the	7th	day	and recovered
1	,,	,,	,,	10th	,,	,,
1	,,	,,	,,	12th	,,	,,
1	,,	,,	,,	13th	,,	,,
1	,,	,,	,,	14th	,,	,,
1	,,	,,	,,	17th	,,	,,
1	,,	,,	,,	24th	,,	,,
2	,,	,,	,,	32nd	,,	,,
9						

UGANDA CATTLE.

Of 9 cattle inoculated at an interval of a fortnight and subsequently at a shorter interval of days with varying doses of serum, viz, 3 with 7.5 c.c.; 3 with 15 c.c. and 3 with 22.5 c.c., per 100 kilos.

1	contracted	Rinderpest	on the	5th	day	and recovered.	
1	,,	,,	,,	6th	,,	,,	died of Rinderpest.
1	,,	,,	,,	6th	,,	,,	recovered.
1	,,	,,	,,	8th	,,	,,	,,
1	,,	,,	,,	10th	,,	,,	,,
1	,,	,,	,,	13th	,,	,,	,,
1	,,	,,	,,	18th	,,	,,	,,
1	,,	,,	,,	24th	,,	,,	,,
1	,,	,,	,,	27th	,,	,,	,,
9							

Conclusions.

Rinderpest Immunisation Experiments.

(1) The inoculation of 2 c.c.'s, Citrated Fresh Virulent Blood, collected on the 3rd day of temperature reaction and Anti Rinderpest Serum at the rate of 15, 30, and 45 c.c.'s., respectively, per 100 kilos body weight, produces a reaction to Rinderpest in susceptible cattle which confers immunity.

(2) A smaller percentage of mortality from Rinderpest occurs at the 30 and 45 c.c.'s rate in comparison with the 15 c.c.'s rate.

(3) The mortality is greater in poor condition cattle.

(4) Exposure to adverse climatic conditions (constant rains) during the reaction, is responsible for an increase in the death rate, particularly in cattle in poor condition.

(5) The inoculation of 2 c.c.'s., Citrated Fresh Virulent Blood collected on the 3rd day of the temperature reaction and blood of the same bleeding stored at ordinary room temperature for 30 and 40 hours respectively, produces a reaction to Rinderpest in susceptible cattle and immunity in animals which recover.

(6) Fresh Virulent Blood collected on the 3rd day of the temperature reaction and varying rates of Anti Rinderpest Serum, viz., 15, 22.5., and 30 c.c.'s., respectively, per 100 kilos body weight, produces a reaction to Rinderpest and immunity, but the inoculation of blood of the same bleeding which has been stored for 30 and 40 hours, respectively, and varying rates of Anti Rinderpest Serum viz:—15, 22.5., and 30 c.c.'s., per 100 kilos does not always result in a reaction to Rinderpest.

(7) Some of the animals which fail to react contract Rinderpest by contact from the reacting animals, others may escape becoming infected and in which case remain susceptible. (From a practical point of view this latter observation is of importance inasmuch as it would explain the cause of some animals which had been double inoculated and branded A.M.—Immune to Rinderpest—contracting Rinderpest at some later date.

(8) The use of Fresh Virulent Blood in rinderpest immunisation operations is of fundamental importance.

Immunisation of Unweaned Calves.

(9) A partial but not complete immunity exists in some unweaned calves born of immune parents.

In such, the inoculation of Fresh Virulent Blood only, may produce (1) no apparent reaction, or (2) a slight reaction which manifests itself either in slight Lachrymation or a Temperature Reaction, or both. The Temperature reaction may be irregular in character.

(10) Some unweaned calves born of immune parents possess little or no immunity: in such, the inoculation of *Fresh Virulent Blood only*, usually causes a visible reaction and may be responsible for some mortality.

(11) A high percentage of mortality from Rinderpest may occur in unweaned calves (born of susceptible mothers), as the result of inoculation of fresh virulent blood only.

(12) The double inoculation of fresh virulent blood and Anti Rinderpest Serum at the rate of 15 and 30 c.c. respectively, produces a reaction in susceptible unweaned calves, which possess little or no partial immunity.

(13) Double inoculation with virulent blood collected some hours previously (27-30) and Anti Rinderpest Serum at the rate of 15 and 30 c.c. per 100 kilos body weight may be responsible for the occurrence of non-reactions in susceptible unweaned calves.

Non-reactors may contract rinderpest by contact from reacting animals.

14. Double inoculation of unweaned calves does not always produce immunity.

A percentage may react when re-inoculated.

(15) Generally speaking, the partial immunity appears to be most marked in unweaned calves up till about two or three months after birth and decreases gradually from then onwards until after weaning and has usually disappeared a few weeks later.

SERUM ALONE INOCULATION.

(16) Animals which contract Rinderpest by contact when under serum treatment and recover, acquire immunity.

(17) Some are in contact some weeks before they contract rinderpest.

(18) The dose of serum per 100 kilos should be increased for highly susceptible cattle.

(19) Large doses (300-1,000 c.c.) in the early phase of the disease would appear to have a curative effect.

(20) The reaction to rinderpest contracted either (A) naturally, or (B) transmitted by inoculation may cause:—

(1) A *recurrence* of Redwater and Anaplasmosis or other protozoal diseases in animals already recovered from these infections, which *recurrence* may be a contributory cause of death.

(2) Abortion.

(2). PLEURO-PNEUMONIA INOCULATION WITH (a) LYMPH AND (b) CULTURE VIRUS.

In the Annual Report of the Veterinary Pathologist for the year ending March 31st, 1919, the results of transmission and culture experiments which confirmed the existence of bovine Pleuro-pneumonia on some farms in the colonised portion of the Colony are recorded.

Since April, 1919, different strains of virus were maintained at the Laboratory by passage through cattle for the supply of virus for inoculation purposes, the total number of doses issued amounted to approximately 6,792.

The results obtained in the practice were not wholly satisfactory, as for example:—

(1) The percentage of reactions varied.

(2) The nature of the reactions were not uniform in character.

(3) The reactions were, in many cases, uncontrollable, with the result that the virus extended to the root of the tail and sometimes beyond.

(4) The percentage of mortality varied from 0% to 28.8%.

Moreover, considerable difficulty was experienced in obtaining sufficient virus by the above method. In many cases the tumour which developed as a result of inoculation behind the shoulder was not rich in lymph.

It was recognised that the demand for culture virus for inoculation purposes would probably later increase, and arrangements were made to secure the necessary laboratory apparatus to meet possible future requirements. Unfortunately, this was lost in transit and the work had to be carried on with improvised material; in spite of the difficulties 23,558 doses were issued and at the moment of writing the output is 7,000 doses monthly.

It is anticipated that the future requirements will be considerable and attention has been drawn to the urgent necessity of securing the necessary apparatus to cope with this.

The results obtained in the initial attempt to produce a culture virus were not entirely satisfactory: it was found that the results of inoculation of the original culture, as well as the 1st and 2nd generation sub-cultures, corresponded with those obtained with the original virus and referred to above, and it was decided to determine whether it was possible to produce a culture virus of fixed virulency by passage in subculture.

The results at the moment shew that a culture of *known activity* can be prepared and that the virulency remains fixed for at least 6 months.

The results of the Laboratory Experiments in connection with the preparation of Lymph and Pure Culture Virus and available statistics of inoculation in the practice are now given.

Statistics of the total number of inoculations in the field and the results therefrom are not yet available but those given were compiled from particulars of results obtained by the following Veterinary Officers: Major Brassey-Edwards, Captain Henderson, and Captain Wheeler, and kindly furnished by Major Kennedy, Acting Chief Veterinary Officer.

(1) Laboratory Experiments:—

Observations in connection with the Laboratory experiments included the following:—

1. The percentage and character of the reactions which result from the

   (*a*) Subcutaneous "behind the shoulder" inoculation of lymph virus of different strains.

   (*b*) Tail inoculation of lymph virus of different strains.

   (*c*) Subcutaneous inoculation "behind the shoulder" of a pure culture virus of different strains.

   (*d*) Tail inoculation of a pure culture virus of different strains.

   (*e*) Subcutaneous inoculation "behind the shoulder" of a filtrate of lymph virus.

2. A comparison of the character of the reactions which result from the inoculation of (*a*) lymph and (*b*) pure culture virus.

3. Does the passage through cattle effect the virulency?

4. Is the virulency decreased or fixed by sub-culture?

5. Immunity tests.

6. Resistance of virus and culture at rooom temperatures.

(1) Lymph virus. (2) Culture Virus.

(1) Lymph Virus was obtained from two different sources, viz:—

(1) Kajiado (Kajiado strain).

(2) N'gong (N'gong strain).

In each instance, the original virus, viz: Pleural exudate was collected as aseptically as field conditions would permit from a case in which no putrefactive changes were found on post-mortem.

Each strain was then maintained by passage through susceptible Native or Grade cattle which varied in age from about 9-12 months old and upwards.

Exceptionally unweaned calves were put in experiment: a synovitis frequently resulted and their use was discontinued for this reason.

(2) Culture Virus.

Cultures were made by the method introduced by Nocard and Roux in Bouillon-Martin plus 10% cattle serum from the original virus (primary lymph) or from virus after passage through cattle (secondary lymph).

The original cultures and sub-cultures were inoculated to susceptible cattle.

In the filtrate experiments a 2% dilution of virus in distilled water or in Bouillon-Martin without the addition of serum, was used.

Large doses (100-300 c.c.'s) of the filtrate were inoculated subcutaneously.

Experimental animals were put on temperature and kept under observation from the date of inoculation until the termination of the experiment and the results recorded.

Technique of Inoculation.

The site selected for the subcutaneous, behind the shoulder, inoculation of lymph virus or culture was usually about 9 inches behind the scapula and the middle of the chest wall, that for the tail inoculation being about 2-3 inches from the tip of the tail.

Prior to inoculation, the hair at the site of injection was clipped off and the skin well washed with an antiseptic wash—2% Lysol or 5% Jeyes. The removal of the hair from and for a few inches round the site of the injection in the tail was found to be of assistance in distinguishing the commencement of a reaction. A hypodermic syringe was utilised for inoculating the lymph or culture virus; sometimes the seton (worsted) method was employed, the former, however, was found to be the cleanest and surest.

Treatment of Reacting Animals.

As soon as the tail reaction commenced the skin at about 6-ins. above the upper limit of the reaction was cauterised in the shape of a ring.

This was not always found to be successful in preventing the extension of the reaction upwards towards the root of the tail, in such cases the following treatment gave satisfactory results, viz: immediately there was an indication of the reaction extending beyond the seat of cauterisation and upwards, 4 longitudinal incisions were made, viz: one on each side, one on the upper and one on the under surface of the tail through the skin and subcutaneous tissues of the advancing swelling.

The incisions were freely washed with an antiseptic, e.g., 2% Lysol or 5% Jeyes, then covered with cotton wool previously soaked in the antiseptic, and a bandage applied.

In those cases in which the reaction had already extended beyond the root of the tail, the scarifications did not, as a rule, prevent the further extension of the virus.

In some instances in which a swelling developed on the rump, incisions were made in the tumour but a secondary infection with suppuration followed and some weeks elapsed before cicatrisation was complete and for this reason, the method was not adopted as a general procedure.

Cauterisation of the skin at the margin of the tumour on the rump was sometimes resorted to in preference to scarifying; in some instances this appeared to limit the extension of the virus, on the other hand, the desired effects were not obtained.

In the case of animals which were reacting to "behind the shoulder" inoculation but which were not likely to furnish any quantity of virus, but in which it was necessary to obtain sufficient for maintaining the strain by passage and for experimental inoculation, a deep incision was made and a piece of tissue of the length of the tumour and about one inch in width removed. This was emulsified in saline solution and the emulsion inoculated. The above-mentioned incision was washed daily with an antiseptic wash, a secondary infection with suppuration followed, cicatrisation as a rule being complete in 3-4 weeks or thereabouts.

SUMMARY OF RESULTS OF EXPERIMENTS. KAJIADO STRAIN.

Inoculation Experiments.

(1) Lymph Virus.

The following percentage of reactions occurred to:—

(*a*) The subcutaneous "behind the shoulder" inoculation 100%

Total in experiment ... 16

(b) The tail inoculation 99%

Total in experiment ... 11

(*c*) The subcutaneous "behind the shoulder" inoculation of a 2% Filtrate (Massen) ... 100%

Total in experiment ... 3

(*d*) The subcutaneous "behind the shoulder" inoculation of a 2% Filtrate (Chamberland "F") 66%

(2) Culture Virus.

(*a*)	The subcutaneous inoculation 'behind the shoulder''	72%
	Total in experiment ...	11
(*b*)	The tail inoculation	56%
	Total in experiment ...	32

Comparison of reactions produced with (*a*) Lymph and (*b*) Pure Culture Virus.

The reactions which resulted from the inoculation of *original* pure culture and 1st and 2nd Generation sub-cultures were as marked as those which were produced by Lymph Virus.

The culture virus of later generations (25th, 28th, and 31st) produced less marked reactions with little tendency to extension up the tail.

Does the passage through Cattle affect the virulency of Lymph Virus?

No apparent increase or decrease of virulency was noted up to the Seventh Generation.

Virus of the 1st Generation produced as marked reactions as that of the 7th Generation.

Susceptibility plays a rôle:—

Virus of a given Generation produced in some cattle an extensive local reaction followed by death: in others a not extensive reaction followed by recovery.

Is the Virulency decreased in sub-culture?

Less marked reactions occurred with sub-culture of the 25th, 28th, and 31st Generations than with the original culture and 1st and 2nd Generation sub-culture.

Immunity Tests:—

The subcutaneous "behind the shoulder" inoculation of Lymph virus of a strain (N'gong) which caused extensive swellings and sometimes death in susceptible cattle was used to test the immunity conferred by Tail and subcutaneously, "behind the shoulder" inoculation of sub-cultures of the 1st, 25th, 28th, and 31st Generations (Kajiado Strain), with the result that, in the case of reactors, in some instances, a slight non-extensive reaction followed which had disappeared in a few days time.

In one instance an animal which had reacted to a Filtrate of Lymph Virus gave a slight local reaction to the tail inoculation of Lymph Virus of another strain.

Resistance of (*a*) virus and (*b*) culture when stored at ordinary room temperature.

(*a*) Glycerinated virus (1 Glycerine, 4 of virus) stored at ordinary room temperature was found to remain virulent for at least 21 days.

(*b*) Cultures of 11 days old were virulent.

3 cattle put in test with a 31 days old culture gave no apparent reaction but were found to be refractory when re-inoculated.

SUMMARY OF RESULTS OF EXPERIMENTS N'GONG STRAIN.

Inoculation Experiments:—

(1) Lymph Virus.

The following percentage of reactions occurred to:—

(*a*) The subcutaneous "behind the shoulder" inoculation 100%
Total in Experiment 32

(*b*) The Tail inoculation 80%
Total in Experiment ... 5

(2) Culture Virus.

(*a*) The subcutaneous "behind the shoulder" inoculation 100%
Total in Experiment ... 2

(*b*) The Tail inoculation 66%
(1st and 2nd Generation)
(Sub-culture).

Comparison of reactions produced with (*a*) Lymph and (*b*) Pure Culture Virus.

The reactions produced with 1st and 2nd Generation sub-cultures were as marked as those which resulted from lymph virus with a tendency to extend from the site of inoculation upwards to the root of Tail and Rump despite careful and close observation and cauterisation.

Does the passage through Cattle affect the Virulency of a Strain?

No apparent increase or decrease of Virulency was noted.

Virus of the 12th Generation produced as marked reactions as that of the original or 1st Generation Virus and *vise versa*.

Susceptibility plays a rôle.

Virus of a given generation produced in some animals an extensive local reaction: sometimes death, in others a slight reaction and recovery.

IS THE VIRULENCY DECREASED BY SUB-CULTURES?

Only 1st and 2nd Generation sub-cultures were inoculated and which, as stated above, were as virulent as the lymph virus.

Of 3 animals which did not react to the Tail inoculation of a Culture: 1 gave a slight reaction *when inoculated in the Tail with virus of the same strain.*

A doubtful reactor when re-inoculated with Virus of the same strain did not react.

No reactions occurred in 8 cattle which had previously reacted to Lymph Virus.

Inoculation in the Practice.

The following statistics were compiled from results to hand of inoculation with:—

(1) Culture Virus (of 27th to 42nd Generation sub-cultures) Kajiado Strain).

(2) Lymph Virus, Kajiado Strain.

(3) Culture virus (Original and 1st and 2nd Generation sub-culture), N'gong strain).

(4) Lymph Virus, N'gong strain.

Culture Virus of Sub-cultures (27th to 42nd Generation Sub-cultures).

Strain.	Number inoculated.	Number Re-acted.	Percentage of reactions.	Mortality.	REMARKS.
Kajiado	264	258	97·72%	Nil	Reactions easily controlled.
do	90	90	100%	Nil	do
do	111	95	35%	Nil	do
do	2,420	No details	...	15%	
do	1,560	do	...	Nil	Up to 24th day after inoculation.
do	454	do	...	·2%	
Total ...	4 899			·003%	

LYMPH VIRUS CULTIVATED BY PASSAGE THROUGH CALVES.

Kajiado ...	1,055	1,050	3·6%	Reactions on the whole marked and not easily controlled. 344 were fired on rump or root of tail.

ORIGINAL CULTURE.

Culture Virus of 1st and 2nd Generations.

Strain.	Number Inoculated.	Number reacted.	Percentage of Reactions.	Mortality.	Remarks.
N'gong ...	1,246	No details	No details.	6·4%	

Lymph virus cultivated by passage through calves.

N'gong ...	35	35	100%	13%
	26	25	95·7%	15½%
	62	62	100%	10%
	47	46	98%	2%
	334	No details.	No details.	14%
	19	do	do	16%
	44	do	do	9·1%
	52	do	do	2%
	207	do	do	7%
	66	do	do	28·8%
Total ...	892			13% — average percentage.

Conclusions:—

(1) The percentage of reactions in susceptibe cattle, to the Tail inoculation of Lymph Virus, varies.

(2) The character of the local reactions in susceptible cattle, produced by Lymph Virus varies.

In some animals an extensive swelling followed by death results.

In others, a reaction which remains more or less localised, followed by recovery occurs.

Susceptibility plays a rôle.

(3) The percentage of reactions in susceptible cattle which results from the Tail and subcutaneous "behind the shoulder" inoculation of culture varies.

(4) The character of the reactions produced by Culture virus varies according to the Generation of the sub-culture.

The original culture and 1st and 2nd Generation sub-cultures are as virulent as the virus from which they originated.

The 25th Generation and subsequent sub-cultures (Kajiado Strain), produce less marked reactions and with little or no tendency to extend up the tail.

(5) The virulency of a culture remains constant for, at least, 17 generations after becoming fixed by passage in sub-culture.

The virulency is fixed at the 25th Generation and probably earlier.

(6) The passage through cattle of Lymph virus does not produce any apparent variation in Virulency for several generations at least.

(7) Some susceptible cattle possess a degree of resistance against an original inoculation but which may be broken by a subsequent inoculation.

Non-reactors should be re-inoculated.

(8) Some susceptible cattle possess a resistance against an original and subsequent inoculation.

(9) Re-inoculation "behind the shoulder" with Lymph Virus sometimes produces in cattle, which had reacted and recovered to the inoculation of culture or Lymph virus, a slight local reaction with no tendency to extend and which disappears in a few days time.

(10) Glycerinated lymph virus (1-4) is effective up till 21 days, at least, when stored in the dark at ordinary room temperature.

11 days old cultures of fixed virulency produced reactions.

31 days old cultures used in the Field were virulent.

In both instances kept in a dark place before use.

The Rinderpest immunisation investigations and Pleuropneumonia experiments include experiments which were continued after the close of the Financial Year in order that complete results could be submitted.

NEW APPOINTMENTS FOR THE FINANCIAL YEAR 1921.

(April to December).

In July, 1916, the late Veterinary Pathologist submitted to the Authorities a comprehensive memorandum 567/No. A.9/5/2/2., detailing the lines on which the work of this Laboratory should extend. This Extension Scheme was then strongly recommended by the Local Authorities and Sir Henry Belfield in submitting it to the Secretary of State acquiesced in its importance and necessity. In his reply (No. 515 of July 1917) the Secretary of State in his enthusiastic support of the Scheme asked that, if possible, provisions should then be made to start the Extension; but unfortunately, owing to the War and the lack of money since then, it was not possible to proceed with the matter. A certain amount of the work in the way of buildings however, has been put in hand but a large proportion still remains to be done.

I might mention that I agree in general with the late Veterinary Pathologist's recommendations and though slight alterations in his proposals are in the light of our present knowledge, necessary, I am adhering for the most part to his programme.

Again, under the new awakening energies of the Government whereby the combatting of Stock Diseases takes such an important part, every step possible should be taken to proceed with the Extension and to equip this institution without delay, in order that the Laboratory investigations may keep ahead of the advance in the Live Stock industry and so prepare the way for the application of Veterinary measures.

A considerable amount of Research work remains to be accomplished. That of more urgent importance being in connection with the following:—

(1) Pleuro-pneumonia.

(2) Entomological Research work in relation to its application to Veterinary Science.

(3) Parasitological Research.

(4) Rinderpest immunisation.

(5) Heartwater immunisatoin.

(6) Prophylaxis of Swine Fever.

(1) Pleuro-pneumonia.

Further Laboratory work is necessary in connection with:—

(*a*) The diagnosis of affected animals.

The value of the following Serological Tests employed in some other diseases, should be investigated.

Complement Fixation.

Precipitin.

Conglutination.

(*b*) The possibility of growing the Pleuro-pneumonia organism in bulk by a simpler method than the classical one.

(*c*) The significance of the "Non-reactor" phenomenon.

(*d*) The vitality of the organism of Pleuro-pneumonia in culture when stored under ordinary conditions.

Field Experiments.

(*e*) Immunity Tests.

Duration of immunity resulting from inoculation of:

(*a*) Cultures of different virulency; (*b*) Field or Calf Virus.

Immunisation of calves.

(*f*) The Transmission of Pleuro-pneumonia under natural conditions.

(2) Entomological Research:—

Animal parasites play such a large rôle in the Stock Diseases in this Colony that it is most essential that an Entomologist should be included in the Laboratory Staff, in order that Research work in connection with the following could be carried out:—

(*a*) Transmission of Trypanosomiasis by Fly other than Glossinae, as, for instance, Stomoxys, etc.

(*b*) The classification and life history of Ticks which exist in this Colony and the rôle they play in the transmission of the various diseases, as for instance:—

Heartwater in sheep, goats and cattle.

East Coast Fever.

Ulcerative Lymphangitis.

Streptothricosis, etc.

(*c*) Classification and life history of parasites other than Ticks which may be responsible for the transmission of other diseases, e.g.,

Blue-tongue.

Horse-sickness, etc.

(*d*) Dipping experiments in connection with the preventive treatment of Heartwater in sheep and goats.

(*e*) Wild game and birds (other than domesticated) as the hosts of various Ticks and the rôle they play in disseminating these.

I agree that the work of Classification could be undertaken by the Entomological Division, but the prosecution of experiments into the relation of Parasites to Diseases should fall within the control of this Division and for this purpose an Entomologist trained on Veterinary lines should be available to work hand-in-hand with the Pathologist.

(3) Parasitological Research particularly in connection with the following is necessary:—

(*a*) Wild Game as the host of intestinal parasites, as, for instance, Wireworm in Sheep, Nodular disease in Cattle and Sheep and their rôle in maintaining infection.

(*b*) The life history of parasites, e.g.,

Lungworm in Cattle.

Distoma infection (Fluke) in Cattle and sheep, etc.

Echinococcus infection, particularly in cattle.

Etc.

I have the honour to be,

Sir,

Your obedient Servant,

J. WALKER.

Veterinary Pathologist.

APPENDIX D.

ANNUAL REPORT

OF THE

Division of Entomology,

Kabete,

FOR THE YEAR ENDING

31st March, 1920.

Entomological Laboratory,
Kabete, July 19th, 1920.

THE HONOURABLE,
THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

In the absence of the Entomologist I have the honour to submit herewith a report on the work of the Division of Entomology for the year ending March 31st, 1920.

Mr. T. J. Anderson, the Entomologist, after being in Hospital for some time, went on leave owing to ill-health on November 13th, 1919.

Mr. H. Wilkinson, A.R.C.Sc., Entomologist for Coffee, arrived in this country on March 23rd, 1920.

Mr. A. H. Wilson, the Plant Import Inspector, has carried out his duties at the Coast throughout the year, and I have the honour to forward herewith his Annual Report.

Mr. T. X. Da'Cruz, clerk at this Laboratory, has carried out his work helpfully throughout the year, often rendering assistance at work falling outside the usual duties of a clerk.

My thanks are due to Mr. H. M. Loeter for many excellent insect drawings and paintings.

The new Laboratory near to the East boundary of the Government Farm at Kabete was completed, being occupied in August, 1919. A wood and iron building consisting of an insectary and three rooms serving, two as stores, and one as temporary quarters for Mr. Da'Cruz, was constructed chiefly out of material from the old Laboratory.

In view of the presence of Trypanosomiasis on the Nzoia River, Mr. Anderson carried out a Fly Survey of the Nzoia River and its tributaries in April, May, and June, 1919. He reported as follows:—

1. In the collections of this Laboratory there are no specimens of any species of Glossina from the Nzoia Valley adjoining the Trans Nzoia. Where the river enters the Lake and for some distance up *G. palpalis* is found.

G. pallidipes is recorded not far from Mumias. How far up the river *pallidipes* extends I am unable to state as no systematic examination has been done, but, as is explained later, *pallidipes* has not been found in B.E.A. at a higher elevation than 4,200 feet.

2. The species of Glossina recorded from the Protectorate are:—

(*a*) *Glossina fusca*, Walk.

This is a West Coast form and the only record from this Protectorate was by the late Mr. R. B. Woosnam who found a few specimens on the Enderrit River, a tributary of the Mara, at an elevation of 5,000 feet.

(*b*) *Glossina palpalis*, Rob. Dsv.

This species frequents the shores of Lake Victoria Nyanza and for some distance up the rivers running into the Lake. It has not been found above 3,870 feet.

(*c*) *Glossina austeni*, Newst.

Is found in fairly dense forest on the borders of rivers. The highest elevation at which this species has been found was about 2,500 feet, Himo River, 1916.

(*d*) *Glossina brevipalpis*, Newst.

Has not been recorded from high altitudes but is common on the Coast Belt to an elevation of 1,700 feet.

(*e*) *Glossina longipennis*, Corti.

Is characteristic of drier regions and deserts. Common in the Taru Desert at certain seasons and frequently enters the railway carriages.

(*f*) *Glossina pallidipes*, Aust.

The highest elevation in the Protectorate from which this species has been recorded is about 4,200 feet, on the Nguruman Escarpment.

The highest elevation, therefore, at which any species of Tsetse has been recorded from the Protectorate is 5,200 feet, and, as far as I am aware, the record for the whole of Africa is from the Belgian Congo at an elevation of 5,500.

As most of the Trans Nzoia is above this elevation, it seemed doubtful from the outset that this was a "fly area."

3. The first information that Trypanosomes had been demonstrated in cattle from the Nzoia is contained in Veterinary Officer McCall's report dated 16.12.18, a copy of which I received on the 21.2.19. He states that "Four outbreaks have now been demonstrated on the Nzoia and in each case the cattle affected were habitually grazed on the river bank and in the river valley. The farms are contiguous and it would seem that a considerable portion of the bank of the Nzoia must be affected and that the infected areas may include the lower reaches of the Quoitobbos and Noigamaget streams."

1. Owing to the unfavourable conditions, grass fires, etc., Mr. McCall was unable to make a thorough investigation of the river valley. No specimens of fly were found.

2. Trypanosomes were demonstrated in work oxen only, although together with the breeding stock and squatters' cattle had been grazing and watering in exactly the same places. It seems strange, therefore, that only the work oxen were infected and that "all breeding stock and the squatters' cattle, approximately amounting to 2,000 being clean."

3. Of the eighty odd work oxen, segregated as being infected, on Mr. A. C. Hoey's farm very few have died and the remainder are now back in the ploughs and looking fit and well. In Mr. Hoey's opinion his losses were almost entirely due to East Coast Fever.

The same remarks apply to Mr. C. Wright's cattle. He has had few deaths and the remainder are now working. He was absent from the farm at the time of the supposed outbreak and cannot state definitely the cause of death.

5. Mr. Turner puts the deaths on his farm down to over work and insufficient feeding. He lost sixteen in all: the others are now quite fit. Of his squatters' cattle which graze and water closer to the river, none have died.

6. The one ox which was infected on Mr. W. H. Hoey's farm had been trading in the North near the Turquel River and was very probably infected there.

7. No further cases have been demonstrated on any of these farms for at least nine months though conditions were favourable had the fly been present.

4. It was also rumoured that "Fly" existed on the Rongai River, particularly on the farms numbered 190, 193, 195, 197, 198, on the allotment map.

I failed to find fly anywhere on the Rongai River. None of the farmers on the western bank of the river have ever lost an animal from "Fly," though their cattle and those of the squatters habitually graze near the river and frequently cross to the opposite bank.

The altitude of the river at farm 198 is 5,900 feet and this, of course, increases as the river is ascended. There is no record of any species of Glossina having been found at this elevation and, moreover, the temperature in the river bed frequently falls to freezing point.

5. No specimens of Glossina were found in the valley of the Quitobbos River. Cattle were grazing on the river banks.

6. A careful search was made on the banks of the Nzoia, Rongai, Quitobbos and Noigamaget Rivers, but not a single specimen of Tsetse Fly was found.

7. All the evidence, therefore, points to the fact that this is not a "fly area" but that oxen which showed Trypanosomes in their blood had been traded or had come from or through a "fly area" and there been infected before reaching the Nzoia farms.

I am unable to state how many blood slides were taken or in how many of these Trypanosomes were found.

8. Should it be found, however, that "Fly" does exist in patches on these rivers, cattle can be grazed and watered on most of the farms without going down into the river valley."

Bulletin 1 of the Division of Entomology, "The Coffee Bug, *Antestia lineaticollis*, Stal.," was published in May, 1919.

From September 8th to 24th I was absent from Kabete on a Fly Survey in the Sonjo Valley at the foot of the Laikipia Escarpment in the Solai Township Reserve and on neighbouring farms. This work was undertaken following a request from the Acting Provincial Commissioner, Naivasha, made by him on account of rumours of the existence of Tsetse Fly in the Solai Township Reserve. I went down the River as far as the North boundary of the lowest new farm, No. 684 b., and failed to take any Tsetse Fly during the trip. After collecting insects on the spot and gathering information from Europeans and Natives who know the country I came to the conclusion that it is not likely that Tsetse Fly will be found in the Township Reserve or on adjacent farms, but that it is desirable that further search should be made on the farms lower down the river under weather conditions more favourable to Tsetse Fly. In June, 1920, while at Nakuru, I met the settlers who have taken up one of the new farms adjoining the Township Reserve and they told me that they had not seen anything of Tsetse Fly on their farm.

At the Agricultural Show at Nairobi on October 17th and 18th an Exhibit of Entomology was demonstrated. A catalogue of the Exhibit was issued as Bulletin 2 of the Division of Entomo-

logy. As explained by Mr. Anderson in the Introduction the general scheme of both Exhibit and Catalogue was copied from the publications of the Department of Agriculture, Washington, America. The Exhibit was classified as follows:—

INSECTS AND AGRICULTURE.

INSECTS AND DOMESTIC ANIMALS.

INSECTS WHICH MAY SPREAD DISEASE.

USEFUL OR BENEFICIAL INSECTS.

INSECTS DAMAGING STORED PRODUCTS.

INSECTS WHICH DIRECTLY INJURE OR ANNOY HUMAN BEINGS.

INSECTS YIELDING USEFUL PRODUCTS.

SPECIAL EXHIBITS.

Mr. Anderson devoted considerable time to the planning and preparation of this Exhibit, setting up a number of cases of insects and making many pen and ink drawings. Mr. Loeter assisted with drawings and paintings which attracted especial notice at the Show. The material thus put together makes an excellent foundation for any similar demonstrations which may be given at future shows and at the same time makes a nucleus of educational exhibits for the Entomological Museum in the central room of the new laboratory building. Since the Show these cases and illustrations have been examined by a considerable number of visitors to the laboratory and have also been used in the lectures and demonstrations given to new settlers at Kabete.

The Catalogue of the Exhibit, Bulletin 2, is the most complete list so far published of the economic insects of the country, which are classified under the heads indicated above. The Agricultural insects are classified under their host plants. The distribution of each species of mosquito, so far as at present known, is recorded.

From November 19th to 23rd I was away from Kabete on a visit to a sisal plantation at Masongaleni. Over an area of about 60 acres of sisal a large proportion of the plants had been damaged by the breaking of the spike in the centre of the plants. While baboons were known to be one cause of the damage a large cricket found in the plantation was suspected of causing part of it. After examining the damage to the plants, plotting its distribution in the plantation, and collecting insects there, I formed the opinion that the whole of the damage must be put down to baboons.

In January, 1920, lectures and demonstrations in Agricultural Entomology were given in the course for settlers at Kabete.

From February 16th to 19th, 1920, in company with the Advisor for Coffee, I was visiting plantations in the Athi River and Donyo Sabuk district, Citrus Nursery inspection being the chief occasion for the trip. The Coffee Bug (*Antestia lineaticollis*, Stal.) and Coffee Thrips (*Diarthrothrips coffeae*, Williams) were found in a few plantations, but not in serious numbers. Parasitised Coffee eggs were found. This is the first record of these two Coffee insects in that district.

From February 22nd to March 12th I was away at the Coast. My work there was in connection with the treatment of Maize infested with insect pests and with the Coconut Beetle Traps.

On March 22nd I left for a safari to Kericho and other places up country which extended into the next official year. Cases of Trypanosomiasis had been demonstrated on the Ottley Syndicate Farm near Kericho and the chief object of the trip was to investigate the blood-sucking fly fauna on that Farm and in any other neighbouring country into which it might seem advisable to carry the inquiry. The results of that work are summarised as follows:—

1. The blood-sucking flies found on the Ottley Syndicate Farm and adjoining land were four or more species of *Haematopota* and more than one species of *Stomoxys*.

2. Tsetse flies were not found on this land or anywhere on the same river system as far as a point on the Sondo River 15 miles away in a direct line, this being the lowest point reached on the trip.

3. Only a single individual of the genus *Tabanus* was taken on the trip, at a point about ten miles West of the Farm.

4. A *Simulium* which occurs in swarms in the forest North and South of the Chemosit River is possibly the cause of the poor state of health of a number of Lumbwas, but there is no reason to suppose that it transmits any disease of cattle. Moreover, I failed to find this Simulium on or near the Ottley Syndicate Land. It is therefore not a factor in the presence or transmission of Trypanosomiasis there.

5. The total number of proved cases of Trypanosomiasis up to May 3rd was 10, out of a total number of animals given to me as having been owned by the Ottley Syndicate of 63. Of 15 other animals which had died or been killed probably some had Trypanosomiasis.

6. The animals on the Farm had all been purchased and had come from four different sources. Those proved to have Trypanosomiasis had come from three, possibly from all four, of those sources. There is just a chance that animals from two of the sources from which animals which had the disease had come came originally from the same mob.

7. The second animal which was proved to have Trypanosomiasis came on to the Farm early in February, having been purchased from one dealer, after the death, on February 1st., of the first animal proved to have the disease, which had been bought from a different dealer.

8. It does appear probable that Trypanosomiasis has been transmitted on the Farm, Stomoxys being the most likely agent.

A number of outbreaks of caterpillars on Flax, *Plusia orichalcea*, F., being the best known species, occurred during the year, and some time was spent in work on this pest. Since the close of the year further work has been done and the results of all work to date have already been reported and made public.

Mulberry Silkworms have been breeding in the Insectary throughout the year, but it has not been practicable to devote serious attention to silk. Eggs have been given to a number of persons interested. A report on a sample of mulberry silk cocoons which had been produced at Kabete was received from the Imperial Institute under date September 11th 1919, from which the following quotation is taken:—

> "The Cocoons were submitted through the Imperial Institute Advisory Committee on Silk Production to manufacturers, who stated that they appeared to be of excellent quality and considered that their commercial value would probably be equal to that of the best cocoons produced in Cyprus."

I am greatly indebted to Mr. C. de Minveille, now residing in this country, who was at one time Manager of the Royal Hungarian Filature at Kamarom, for very kind and helpful advice. From what he has told me after examining our cocoons at Kabete and in the light of the Imperial Institute Report, there can be no doubt that conditions here are entirely favourable to the production of Mulberry Silk.

Mulberry Cuttings have been planted on some land adjacent to the Laobratory in order to provide leaves for future work. Another area has been planted with sixteen varieties of Castor Oil so that these may be available if required for work on Eri Silk.

Considerable numbers of insects have been sent for identification to Dr. Guy A. K. Marshall, Director of the Imperial Bureau of Entomology. Our best thanks are due to Dr. Marshall for the identification and return of named specimens of the large numbers of species by which our collection has been increased during the year. A large part of the collection was overhauled and rearranged by Mr. Anderson.

I have the honour to be,
Sir,
Your obedient servant,

F. W. DRY,
Acting Entomologist.

APPENDIX E.

ANNUAL REPORT

OF THE

Mycological Laboratory,

FOR THE YEAR

31st March, 1920.

MYCOLOGICAL LABORATORY,
AINSWORTH HILL.
NAIROBI.
4.2.20.

THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I beg to submit herewith my Annual Report as requested. The period covered is from the 1st April, 1919, to the end of March, 1920.

In May the New Mycological Laboratory built on Ainsworth Hill in the 15 acres of ground surrounding the Provincial Commissioner's old bungalow was opened. The Laboratory is built of stone with a tiled roof and consists of four rooms as follows:— An office, which besides the usual office furniture, contains an herbarium cabinet and several wall cases of dried specimens, a laboratory, to which is attached a small stoned floored sterilising room, and, lastly, a store for fungicides and apparatus.

The increased space has been much appreciated and together with the incubators and a paraffin embedding oven has enabled me to carry out more and better work than was possible in the one room assigned for Mycological work at the Head Office of the Department.

I have also been provided with a temporary clerk whose duties have consisted in typing letters and reports, cleaning delicate glass apparatus, making up fungicides and attending to the pot experiments and the work of natives employed in the grounds.

Coffee.

1. Leaf Disease (*Hemileia vastatrix*). This disease has now become universal and is nearly always to be found in certain seasons of the year, that is, towards the end of the long rains, on practically all Coffee Plantations, with the exception of the higher parts of Limoru and Kericho, which are still exempt. The severity of the outbreak and the resultant damage depends largely upon the altitude of the Plantations and their state of cultivation and pruning.

Spraying with Bordeaux mixture or Carbide mixture has been found very beneficial by those Planters who have had the means to carry out this rather expensive operation during the past year.

2. Other Leaf Diseases. The Leaf Spot Disease due to *Cercospora coffeicola* has been pronounced in places but no very great damage has resulted nor have the ripening berries been attacked this year, as was the case a few seasons ago.

A leaf blotch hitherto unrecorded for this country has recently made its appearance on a few plantations and is due to the fungus *Glocosporium coffeanum*. Large dark brown to black blotches are produced on the leaves of affected trees which increase rapidly in number throughout a plantation under favourable conditions. These conditions have not yet been fully ascertained, but up to the present the disease has appeared in the dry season, when heavy dews are precipitated at night. The damage has not been great, and spraying should quickly control the disease.

3. Berry Diseases.—As mentioned above *Cercospora coffeicola* has not attacked berries this year; but its place has been taken by a species of *Septoria* which produces a curious mottled appearance on the ripening fruits. The berries show this effect just as they commence to turn from greeny yellow to red so that patches of yellow are still left. The details of this disease have not yet been worked out, but the present investigation has shown that on these mottled berries dark sunken areas appear which later produce the fructifications of a species of *Septoria*.

It remains to be ascertained whether or not this species is identical with *S. calcuosa*, which is reported to cause a leaf disease of coffee in South America.

Mottled berries have appeared on a large number of Plantations in nearly every district, but not in sufficient numbers to cause their owners to adopt any precautionary measures as yet.

On heavy low-lying land the trouble is more pronounced and could be easily overcome by spraying the young berries while they are still green.

4. Die-back.—The die-back disease in which the fungus *Colletotrichum coffeanum* is associated, and reported last year as having broken out in the Thika District has not appeared since spraying operations were carried out for its control; but the same fungus together with a species of *Phomopsis* has been found on die-back specimens from the Fort Ternan District.

In this district a great deal of die-back and actual deaths have taken place, the cause of which is by no means clear. In some cases no fungi have been found likely to cause the effect produced and attention has been recently turned to the climatic and soil conditions. The climate is hot and moist, the soil dark and heavy—conditions which would act as predisposing causes of diseases. These in conjunction with neglected cultivation would be certain to bring about serious disease of both leaves and branches. Liming the soil is now under trial; but the whole question of disease in this area needs more thorough investigation than is at present possible under existing facilities. A die-back in which the fungus *Gloesporium coffeanum* plays a prominent part has recently made its appearance in the coffee adjoining the laboratory and is still under investigation.

The phenomenon known as "lightning struck" coffee has again come under my notice and consisted of a small patch of half-a-dozen trees, all of which were discovered to possess a blackening and disintegrated inner bark.

In outward appearance the trees seemed perfectly healthy until they commenced wilting and turning black at the tips of the topmost primaries. Microscopical examination showed that the cambium layer of these trees was completely disintegrated from the top of the trees to ground level; but no mycelium could be detected except in the blackened tips, which in some cases produced later on the fructifications of a species of *Diplodia*. The affected trees were cut down to well below the discolouration of the cortex and have since produced healthy shoots. The trouble has not spread beyond the first observed trees. Two curious facts of constant occurrence at the time cases of this disease have been noticed are worthy of mention. The first that a lightning storm is always reported as having burst over a plantation just before the trees were first observed to show signs of disease; and the second, that the disease never spreads beyond these first affected trees. The relation of these abnormal climatic conditions, the killing of the cambium layer and the appearance of *Diplodia*—a well-known stem parasite of other plants, has still to be investigated. At present all a planter can do is to cut down the trees to within ground level as soon as he finds them affected.

Flax.

The wilt disease of Flax (*Fusarium lini*) appeared this year at Kericho and has evidently been introduced with imported seed. It was also found at Sotik and there is some evidence that it was present at Lumbwa last season. The fungus responsible

for this trouble in a soil dweller and can exist saprophytically in the ground for many years so that it becomes impossible to sow flax on the same land until many years have passed, otherwise the land becomes what is known as "Flax Sick," and the disease appears every season spreading more in each successive crop of flax until a whole field may be destroyed soon after it has started to grow. The sowing of clean seed, rotation and the search for a possible resistant strain of flax are the only methods so far available for overcoming the flax wilt disease.

From the same place the *Macrosporium* disease was also discovered. This was described in my report for 1917 as appearing at the Experimental Farm at Kabete; but up to the present it is only known to occur on the straw of flax ripe for seed and does not attack the green flax for fibre. It is therefore of no particular importance as yet.

Citrus Fruits.

Oranges and tangerines having a dark brown to black discolouration either in patches or altogether brown in colour engaged my attention for a considerable time. At the outset the action of mites was suspected but on the report of the Entomologist that none could be found an investigation was started with the object of finding out whether or not fungi were responsible for this curious appearance of the skin. The search proved unsuccessful except in the case of very dark and old fruits kept for some time in the Laboratory, on which were discovered a sterile mycelium resembling that of *Capnodium* (of "black blight of Coffee").

As, however, the markings did not spread in area the Entomologist was again called in aid and on this occasion the Assistant Entomologist was able to discover the shrivelled remains of undoubted mites. This revived the mite theory of the disease and soon afterwards recent literature from California tended to confirm this opinion. The further investigation and control of this disease is I believe, being continued by the Assistant Entomologist.

In California such oranges are common and are sold as a special dark skinned variety. Only the outermost layer of the skin is affected and the pulp is just as palatable as those of normal hue.

Forestry Plantations.

The work on *Sclerotinia* attacking young specimens of m'hugo trees (*Brachylaena hutchinsi*) was continued from last year but all attempts to get the developing *apothecia* to mature proved unsuccessful. Only young apothecia were found in the field but when brought into the laboratory withered and died, as did also those produced from sclerotia in the laboratory. In some cases the failure to reach maturity was traced to eelworms which were present in large numbers in the young apothecia.

A case of damping off of young seedlings of the East African Cedar (*Juniperus procera*) occurred at Londiani and on investigation in the Laboratory, was found to be due to a species of *Pythium*, all species of which produce the well-known damping off of certain young plants.

Camphor.

The Camphor tree disease is still under investigation at the Arboretum but upto the time of writing no further information has been obtained regarding the parasite.

Pruning and spraying operations have been undertaken with a view to controlling the disease.

Other minor investigations included the following:—

Apple canker due to *Sphaeropsis malorum*; exudation of gum from lime fruits and twigs; bean rust due to *Uromyces appendiculatum*; a slime on Plantation rubber sent from Uganda upon which was found a species of *Penicillium*. Grape Vines affected with *Pestalozzia uvicola*, mulberry leaf spot due to *Septogloeum mori*, Dahlia leaf spot due to a species of *Uroplyctsis*, Early Blight of potatoes, sisal leaves damaged by hail, and the presence of the white rust, *Cystopus candidus*, on the common cruciferous seed *Diplotaxis inopinata*.

Experimental and Hybrid Wheats at Kabete.

Owing to the pressure of pathological work it was not possible to do any hybridising this year although the breeding cage was sown with various small quantities of certain selections during the first season. The following varieties were grown during the two seasons:—

1. First season May 1919 to October 1919.

1 Field Trials 11½ acres.

1 Acre. Cross No. 11 (Early Rieti × Red Fife) sown on 9th May and harvested on the 4th October; yield 240 lbs. This seed was unfortunately mixed in threshing.

1 Acre. "Florence," sown 9th May and harvested on 11th October, yield 600 lbs.

1.35 Acres. Cross 13 (Egyption & Nut Cut) sown 9th May and harvested 4th October; yield 740 lbs., yield per acre 316 lbs.

3 Acres. "Kabete Selected" (Bobs & Rieti), sown 9th May and harvested 13th October; yield 960 lbs., yield per acre 316 lbs.

2 Acres. Cross No. 10/7 (Early Rieti & Thew), sown 9th May and harvested 6th October; yield 680 lbs., yield per acre 340 lbs.

2 Acres. Cross No. 13/5 (Egyption & Nut Cut), sown 9th May and harvested 7th October; yield 860 lbs. yield per acre 430 lbs.

1 Acre. Indian No. 17 (From Pusa), sown 9th May and harvested 4th October; yield 80 lbs. only.

The Manager of the Experimental Farm reported that "A considerable amount of damage was done to this crop by birds and that the weather during the harvesting was very unfavourable."

2. Nursery Plots. (1/90th acre). 2 plots of each variety.

1. Florence.
2. Firbank.
3. Gluyas Early.
4. Australian.
5. Golden Ball.
6. Cross 10/9.
7. Union 31.
8. Cross 10/X.
9. Equator.
10. Bobs & Rieti.
11. Union 52.
12. Lang Koren.
13. Rieti Hybrid.
14. Selection 44/12.
15. Cross 11.
16. Cross 15/1.

Cage. South side commencing at West End.

1. Union 38.
2. Cross 4/4 (Rieti & Thew).
3 & 4 Mixed lot of Union 74/1, Union 31, Selection 4/12, and Cross 11.
5*a*. 15/1/5. (Egyptian & Thew).
5*b*. Smith's 2 (Njoro Mixed).
6*a*. 15/1/2.
6*b*. Smith's 2.
7. 15/1/1.
8. Smith's 3.
9. Smith's Selected.
10. Smith's 4.
11. Smith's Earliest.
12. Selection for Bombay 44/3.
13. Selection for Bombay 44/3.
14. Persian.
15. Selection from (No Name).
16. Selection from South African Wheats.
17. Selection from Cross 10.
18. Selection from South African Rieti.

Nearly all the above suffered from unfavourable weather during the harvest and those in the nursery plots were in addition eaten by birds to such an extent that only about one pound of seed was taken off each plot.

2. Second Season - November, 1919 - March, 1920.

These were sown rather late and have not had the usual amount of rain so that the stand was rather thin.

1. Field trials, sown on 6th November 1919.

2 Acres. Kabete Selected (Bobs and Rieti), yield 302 lbs., yield per acre 151 lbs.

4 Acres. Florence, Yield 1109 lbs., yield per acre 277 lbs.

4 Acres. Cross 13 (Egyptian & Nut Cut), yield 802 lbs., yield per acre 200 lbs.

14 Acres. Cross 13/5. (Egyptian and Nut Cut), yield 1,585 lbs., yield per acre 106 lbs.

8 Acres. Cross 10/7 (Early Rieti & Thew), yield 370 lbs., yield per acre 46 lbs.

Some of the Wheat in the field was lost through the heavy rains during the harvesting, particularly Cross 10/7 on the top ridge.

2. Nursery Plots - 2 Plots each 1/90th acre.

1. No Name.
2. Australian, 4 lbs.
3. Bobs & Rieti, 5 lbs.
4. Heartley's White Nandi, 6 lbs
5. Union 31, 6 lbs.
6. Union 52, 7 lbs.
7. Gluyas Early, 11 lbs.
8. Selection 10/1.
9. Rieti Hybrid.
10. Cross 4/4.
11. Cross 12/1.3¾ lbs.
12. Lang Koren, 2 lbs.
13. Golden Ball.
14. Neapolitan, 5½ lbs.
15. Cross 15/1, 5½ lbs.
16. Smith's Earliest.
17. Early Rieti.
18. Spring.
19. Fourie, 5 lbs.
20. Chernouka.
21. Warren, 9½ lbs.
22. Firbank, 5 lbs.

Some of the Nursery Plots were entire failures owing to weather conditions and in part to attacks by birds.

Correspondence was fairly heavy and among other things the following were written up:—

(1). Regulations of the Diseases of Plants Prevention Ordinance 1910, were re-drafted and published altogether in the Official Gazette for General Information.

(2). A draft Ordinance and Regulations for the proposed Grading of Maize for Export.

This took up considerable time in corresponding with Farmers' Associations and Government Departments.

(3). A pamphlet on wheat in East Africa.

In April and May certain seed testing work was carried out in connection with imported flax seed, a separate report of which was presented at the time. Rye and Kaffir corn were also tested for Government, 12 bags of Kaffir corn was tested for Uganda and also some flax seed for a few settlers. In March 1920 two samples of flax seed and two of lucerne were tested.

In the matter of imported seed it cannot be too strongly urged that all such consignments should be accompanied by a certificate from the country of origin stating the purity and the germinating value.

I visisted Nakuru for a fortnight in August in connection with Flax and Maize, and during the month of September I visited a certain fly area of the Masai Reserve on the S. Guaso Nyero.

I visited Lumbwa, Kericho and Sotik in the early part of March 1920 in connection with the first recorded appearance of Flax Wilt; and directly afterwards proceeded to Fort Ternan to inspect a coffee plantation of 100 acres suffering badly from Leaf Disease. On both of these subjects separate detailed reports have been submitted.

The number of Specimens received at the Laboratory for examination and report was 90.

I am, Sir,

Your obedient Servant,

W. J. DOWSON.

Mycologist

APPENDIX **F.**

ANNUAL REPORT

OF THE

Agricultural Department, Mombasa,

FOR THE YEAR ENDING

31st March, 1920.

AGRICULTURE DEPARTMENT,
MOMBASA.
6TH APRIL, 1920.

THE HON. THE DIRECTOR OF AGRICULTURE.

SIR,

I have the honour to submit my report for the year ending 31st March, 1920.

My routine of duties during the year was to visit the Public and Governor's Gardens daily, seeing that the boys were at work and apportioning their work; visiting the Post Office and Mombasa and Kilindini Customs Houses, to examine parcels of seeds, plants, trees, grain, etc., imported into the Colony, and granting certificates of purity, health, and condition for grain, etc. exported. In addition to these duties, I was placed in charge of the Famine Relief Committee's stores at Kilindini from November 1918 to November 1919, and was kept pretty busy receiving and despatching consignments of maize in connection with the relief works. Since January 1920 I have also visited weekly the maize stored in the Mombasa Bonded Warehouse for the B.E.A. Farmers' Association, reporting on the condition of the grain. Visits of inspection have also been made to various storehouses and godowns in the city (examining beans particularly) assembled there for export.

818 consignments of plants, trees, seeds and grain passed through my hands during the twelve months and were treated according to Regulations, the uncertified consignments receiving special attention and treatment. With few exceptions the imports were all healthy and clean, and faded and dead plants were the result of neglect, want of water, and too long a detention on board or lying unclaimed at the Customs House, rather than of disease or pest. Especial precautions were taken with imports from doubtful areas. In one or two instances cases containing bulbs and stock had lain uncleared from the Customs for three months and when opened up for inspection presented a mass of decayed matter and earth.

The imports may be classed as below, with their corresponding values:—

			£	s.	d.
Vegetable seeds	85	parcels	344	15	0
Flower seeds	134	,,	125	15	4
Farm seeds	97	,,	586	8	10
Forest Tree seed	74	,,	6	17	0
Agricultural seed	209	,,	2412	5	5
Flower plants	157	,,	59	14	0
Fruit trees	62	,,	176	13	7
Total	818		£3712	9	2

The Regulations, I regret to note, directing that "every package or parcel containing plants imported into the Colony must bear on the outside a label on which shall be set forth the particulars of full name of kind and variety of each plant and the place of origin" are mostly ignored and beyond the bare statement "plants" or "bulbs" there is nothing to indicate the contents of the parcel.

Of Flax seed there were 1364 bags imported.

A few bags of sample coffee for personal use were detained and destroyed or submitted to the Head Office for disposal.

Consignments of Citrus Plants were destroyed.

All beans exported were inspected and tested by me and certificates of purity granted. The following list shows the variety of beans and their value.

Canadian Wonder	3973	bags	Rs.521540
Rose Cocoa	9677	,,	Rs.193540
Ordinary Red	10917	,,	Rs. 98255
Ordinary White	4239	,,	Rs.111707
Gotani	1723	,,	Rs. 25845
Total	30529		950887

The quantity of maize fumigated for the public was 2,435 bags, yielding a revenue of Rs. 147/37.

Of coffee and maize I inspected and passed for export 1248 and 20803 bags respectively. These figures do not represent the total shipments, but only such consignments I was called upon to examine.

I have the honour to be,
Sir,
Your obedient servant,

A. H. WILSON.
Plant Import Inspector.

APPENDIX G.

ANNUAL REPORT

OF THE

Advisor for Coffee, Department of Agriculture, Nairobi,

FOR THE YEAR ENDING

31st March, 1920.

DEPARTMENT OF AGRICULTURE,
(P.O. Box No. 133),
NAIROBI,
APRIL, 1920.

THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I have the honour to forward herewith my Annual Report for the year ending 31st March, 1920.

During this period I inspected 123 Plantations and the total number of inspections (including second and third visits) made was 137. Apart from the duties of inspecting for purposes of dealing with outbreaks of diseases and pests, Plantations were visited and advice given on the cultivation and management of the crop. In addition assistance has been rendered through correspondence of an advisory nature.

No serious outbreak of pests or diseases has occurred to any great extent this year, and in nearly all cases where outbreaks of pests or dsease have occurred, it has been to a great extent due to neglect. Record crops in most of the districts have been produced t is season and the total output from the Protectorate will be a record one.

There are approximately 22,000 acres of coffee under cultivation, of this total acreage there are approximately 13,000 acres in Kyambu and Thika comes next with over 2,000 acres. Two thirds of this total acreage are over three years old.

The following is an abstract of Coffee Plantation Reports from the 1st April, 1919, to 31st March, 1920.

ABSTRACT OF COFFEE REPORTS.

Name.	Report No.	Area under plants.			No of Plantations affected with and						Pests.							
		1 to 3	3 to 6	6—on	Leaf Disease	Leaf Spot. Disease	Spotted Berries	Stem Disease	Cutworms	Thrips	Leaf Miner Moth	Berry Moth	Borers	Scale Insects	Plant Bugs	Coffee Bug Ega Parsite	No of Plantations inspected.	Total No. Inspection.
	Total Acreage	Summary of Inspections from 1st April, 1919 to 31st March, 1920.																
Districts.																		
Kyambu ...	3894	1355	1711	828	22	4	2	...		8	19	2	1	8	4	3	36	47
Nakuru ...	436¼	227	207¼	2	2	2	...	...		...	4	...	...	...	...	...	16	16
Songhor ...	1118	517	448	153	6	...	...	...		5	6	...	...	...	2	...	12	12
Fort Ternan and Lumbwa ...	715	369	201	145	4	...	...	6		...	...	...	...	2	1	...	11	13
Nyeri ...	919 9/16	382 1/16	416½	121	3	...	10	...		...	11	...	...	6	...	...	11	11
Thika ...	991	349	472	170	5	3	...	...		4	...	...	...	5	2	...	7	7
Ulu ...	347	240	107	...	5	2	...	...		4	7	...	...	4	2	1	8	8
Koru ...	979	257	593	129	9	1	...	...		6	9	...	...	1	..	...	9	9
Nairobi and Parklands	23⅜	...	16¼	7½	7	3	...	...		...	5	...	...	...	1	...	9	11
Ngong ...	260	79	158	23	...	...	...	...		...	1	...	...	1	...	...	3	3
Limuru ...	70	45	25	...	1	...	...	...		...	...	...	...	...	1	...	1	1
	9753 9/16	3820 1/16	4355	1578½	64	15	12	6		27	62	2	1	27	13	4	123	138

Thrips.

I am glad to report that this pest was not serious this season, neither did it do any material damage. This is due to the favourable weather conditions which existed throughout the year. (A conservative estimate in tons of coffee entirely damaged and lost through this pest last season would be over 100 tons, valued at £60=£6,000).

In April an outbreak occurred in Kyambu, consequently I carried out an experiment, dusting a few affected acres of coffee with one part sulphur and two parts lime. The dusting was done at 6 a.m., midday, and 5 p.m. on the 28th April. The dusting did not kill Thrips by contact for over a period of 16 hours, neither did it appear to be effective, but at the same time, it cannot be considered a fair trial because a few days after the experiment was carried out it was noticed that Thrips was gradually disappearing from the neighbouring plantations, and also on areas which were not dusted on the plantation when the experiment was tried.

This pest appeared again on plantations in several Districts during February of this year, but fortunately directly the rains started in March it was noticed that Thrips disappeared.

Thrips increase rapidly during a drought, but on the advent of the rains and cold weather they do not thrive.

Cutworms.

This pest was not discovered on any of the plantations inspected during the year.

In previous years cutworms have done considerable damage to young coffee.

Antestia.

Several mild outbreaks of the coffee bug have been reported during the year.

In the early part of the year a serious outbreak was reported from Limuru, about 20 to 30 acres of coffee were so badly damaged that drastic pruning and stumping had to be carried out.

The coffee bug egg parasite was introduced into this plantation, and it would appear from the extensive damage done by the Antestia that not sufficient care had been taken to combat this pest in the early stages.

In Upper Kyambu another plantation suffered very severely from Antestia, but this was entirely due to neglect. No attempt was made to combat the bug or to introduce the coffee bug egg parasite. The Antestia has made its appearance for the first time at Songhor, Fort Ternan and Ulu Districts; it was discovered in a mild form at Songhor and Fort Ternan, but in a more serious form in the Ulu District. A bulletin on the Life History of the Antestia was published by the Division of Entomology in 1918. This work has been most helpful to coffee growers who have had to cope with this pest.

Leaf Miner Moth.

Is more or less general throughout the coffee growing districts, there being very few plantations not affected.

The blotch on the leaves due to the grub of the insect gives the plantation when badly affected a very unsightly appearance. No steps have been taken to cope with this pest as it is not considered serious.

Scale Insects.

About three years ago the Scale *Asterolecanium coffeae* was found in Thika District. This year I discovered it on four plantations in Kyambu—other scales found were Green "*Lecanium Africanum*," *Pulvinaria psidii*. Waxy and Mealy Bug, *Ceroplastes ceriferus and Pseudoioccus species, Selenasfidis articulatus* (West Indian Red Scale) *Ceroplastes rubens, Lecanium hemisphaericum* Tarz-Tozz. Of these scale insects the one most commonly found was the Green Scale. Very little spraying is carried cut generally for Scale Insects. Asterolecanium is a most difficult species to get rid of and it has been found that ordinary spraying is not sufficient. Affected trees have to be literally washed with kerosine emulsion or Habas mixture.

The Coffee Berry Moth was found on two plantations. So far this pest has not done any material damage to cause alarm.

The Borer *Apati monacha* was found on one plantation Only a few trees were affected.

Leaf Disease.

Leaf Disease was discovered on 64 plantations, and in nearly all cases where no spraying or manuring had been carried out for the last two years the outbreak was bad.

During the season of 1918-19 no spraying was done; the season was very dry and Leaf Disease was noticed in a mild form, and it was therefore not deemed necessary to take precautions.

I regret that this was so, as, in my opinion, if spraying is not regularly carried out in certain districts, there is a greatly increased danger of a severe epidemic occurring. The best results that have been obtained were from fields which had been heavily manured in the 1918-1919 season and sprayed in 1919.

The beneficial effects of heavy manuring and regular spraying go far towards establishing the value of carrying out this work, even at high cost of material.

I inspected two plantations, one in Koru and one in Fort Ternan, and found the coffee trees in an extremely poor condition and the leaves covered with Leaf Disease. The soil and climatic conditions which exist are favourable to encourage the spread of this fungus, but at the same time, if proper steps had been taken

and the coffee had been kept in a good state of cultivation and sprayed regularly, this could have been avoided. In both cases action was taken by the Department to remedy what might have been a source of disease to neighbouring plantations.

Spotted Berries.

Specimens of spotted berries were brought from Nyeri and Kabete and passed on to the Mycologist for his remarks. He has informed me that the parasite which causes the mottled and black appearance of the coffee berries is a species of Sectoria, and that spraying with dilute Bordeaux Mixture would most likely be effective if applied while the berries are still green. The spotted berries were found on 10 plantations out of 11 inspected at Nyeri, and was present in a bad form on the acre of Blue Mountain Coffee at Kabete Government Farm. At Nyeri the worst affected areas were low-lying valleys and the soil damp in parts.

Leaf Spot Disease.

Cercospora coffeicola was found chiefly on young nursery plants and in one instance on some old coffee which had been badly neglected. *Gleosporium coffeanum*.—A few mild cases were found on coffee leaves and for the first time recorded in this country. The Mycologist reports that this fungus ahs attacked coffee berries. In this last instance the coffee plantation was in a state of neglect; the berries did not ripen but first turned a sickly pallid colour and eventually black.

Stem Disease "Die-back."

In October I submitted to the Mycologist specimens of die-back from Fort Ternan for investigation. The Mycologist reports that he found a species of Phomopsis and symptoms of *Colletotrichum coffeanum* on some of the Fort Ternan specimens, probably causing a certain amount of die-back on weakened trees.

In May one of the affected plantations was sprayed, and a second application was being carried out at the time of my visit (October, 1919). Up to this period no appreciable difference was noticed with regard to die-back, but the trees were looking very healthy and were free from Leaf Disease. This undoubtedly was due to the fact that they had been sprayed with a fungicide.

During this period, from May to October, all wood which showed signs of die-back was cut back and towards the end of the year the die-back lessened considerably. In my opinion the primary cause of die-back in this case was due to the adverse climatic conditions experienced last year; also the trees had been in a state of debility and, therefore, would be more susceptible to disease. A planter who owns a coffee farm in this district states that he first noticed die-back in this form after the trees had been damaged by Thrips.

General.

The acre field of Blue Mountain Coffee propagated from seed received from the West Indies in 1916, planted on the Experimental Farm, Kabete, has been capped for the purpose of finding out the best results of:

A single stem tree with one capping;
A single stem tree with two cappings.
A double stem tree with two cappings.

and uncapped rows as a check.

I regret, however, that owing to a shortage of staff, I have been unable to get the necessary data to show the difference in yield of each section treated differently.

About 65 lbs. of seed gathered from these trees this season have been distributed in various coffee growing districts for trial. Next season a larger quantity of seed will be available for distribution.

Nurseries have been made at Kabete to establish half acre plots of different types of Coffee, and enough seed (of the local type) to propagate five acres of coffee for the purposes of carrying out artificial manurial experiments.

Ten pounds of Maragogipe seed have been ordered from Costa Rica, three pounds each of Jackson's and Kent's Hybrid from Southern India, for trial in the Highlands and ten pounds Liberian Seed from Java for trial at the coast. The seeds have not yet arrived.

Pruning.

Those planters who have systematically pruned are now reaping the benefits of such work, but in general there is considerable room for improvement in the way in which pruning is carried out on the estates.

Damage by Hail and Lightning.

In many districts coffee trees have been struck by lightning and there are certain districts where hail storms are frequent.

Coffee Registration Ordinance.

I regret that I have been unable to keep the Register up-to-date as all the necessary returns have not been received.

Coffee Market.

It is gratifying to see that B.E.A. Coffee is fetching good prices on the London Market. It is already recognised as one of the premier coffees of the world.

I have no doubt that still more satisfactory results will be obtained when the preparation of the bean for market is more thoroughly and uniformly carried out. The highest price touched has been £202 for a small parcel of peaberry.

Visit to Mombasa.

In September, 1919, I visited Mombasa in connection with the Regulations on Coffee passing through in transit from Tanganyika Territory, as it had come to my knowledge that these regulations were not being carried out. A special report dealing with this matter was submitted.

The Coffee industry is progressing rapidly. Many Planters have decided to plant up large acreages, and some have already started. A conservative estimate of Coffee that should be exported annually from the Protectorate is 5,000 tons; each year the output should be greatly increased.

There is still an extensive acreage of land that could be utilised for Coffee in the Protectorate (excluding native reserves). The greatest difficulty at present with this industry is the labour question, viz., to obtain workers at the right time during the picking season; at this period a plantation of 100 acres of coffee in full bearing may require as many as 200 labourers to gather the crop; taking the average all the year round one man per acre is required.

An Agent representing a well-known firm of Coffee Machinery Manufacturers paid a visit to the Protectorate during the year. Up to the present very few plantations have had adequate machinery to cope with the crop.

Mechanical dryers have been installed on a few Estates, this system of drying is a great improvement over sun drying; with the mechanical process, Coffee is more evenly dried and it can be looked upon as a labour and time saving device. A ton of coffee can be picked, treated, and despatched for market well within a week.

Most of the Coffee exported from the Protectorate is sent from the Estates to Coffee Cleaning Mills, but there are a few Estates where Dryers, Hullers, and Graders are installed, who clean and send their Coffee direct to the Market.

Certain information has been received from a reliable source regarding the preparation of consignments of Coffee lately received on the market:—

A consignment of Nairobi Coffee was put up for sale, and it contained 1% of unshelled beans together with a certain quantity of parchment shell. If 99% of the beans can be cleaned the remaining 1% can likewise be done and the parchment shell removed.

A Planter sending Coffee to London in this condition increases his expenses considerably as the charges amount to the same to treat it in London as though it had been entirely unshelled. It is sometimes necessary when hulling to pass the Coffee through the huller a second time. Small hand hullers are not satisfactory for treating coffee which is to be sold on the London market.

The following information was also received:—

That it is a mistake for planters to send over small quantities of any one class under say 40 bags, and that it would be better to ship such small quantities in one lot, and not separated, as it is always more difficult to dispose of 10 bags or so than it is of a larger quantity.

It is my intention to fully inquire into the matter of Coffee grading and the preparation of the bean as required for the London market when in London on leave.

ARTHUR D LE POER TRENCH,
Adviser for Coffee.

Appendix **H.**

ANNUAL REPORT

ON THE

Flax Industry in British East Africa

FOR THE YEAR ENDED

31st March, 1920.

Department of Agriculture,
Nairobi Experimental Farm,
Kabete.
April 19th, 1920.

The Hon. The Director of Agriculture,
Nairobi.

Sir,

I have the honour to submit hereunder my first Annual Report on the Flax Industry in British East Africa, for the year ended 31st March 1920.

I arrived at Kabete, my Headquarters, on the 10th February 1920 and took control of the operations there concerning Flax.

On the Farm I found two plots of Flax, five and six acres respectively, which had just been pulled and was still in the stocks. This I had transferred to Barts and deseeded by hand in the field on the 13th February.

Both plots of Flax were poor in yield, both in straw and seed owing to a variety of causes of which the unbroken drought from the 2nd January was most considerable. The Flax had also been attacked by caterpillars.

No. 6 Plot.

Six acres had been sown broadcast on the 25th October 1919 with Kabete grown Dutch seed at the rate of 60 lbs. per acre. The yield from this plot of dry deseeded Flax Straw and Seed was at the rate of 15 cwt. and 120 lbs. per acre respectively. In both these respects the yield must be considered much below the average in quantity. The straw was short but of fair fibre quality.

No. 15 Plot.

Five acres had been sown broadcast on the 16th October 1919 with imported Seed at the rate of 110 lbs. to the acre. This seed had a very low germinating percentage, and had moreover been more particularly attacked by the caterpillars referred to above. The yield was 18 cwt. of dry deseeded straw and 163 lbs. of seed to the acre. Both these yields are much below what should be expected. In consequence of the thinness of the crop the straw was coase and branchy and of poor fibre quality.

The seed from both these plots has been cleaned and dressed and though small in grain is of better quality than I expected to find. That from Plot No. 15 showed 92% vigorous germination and that from No. 6 95% vigorous germination.

Demonstrations.

Between my arrival on the Farm and my going away on safari on the 27th March I have given many demonstration of the various processes, from the preparation of the seed bed and sowing to the final preparation of the Flax fibre for the market. These demonstrations were all practical and helpful and have been attended by the Officials and Students on the Farm and many outside Flax growers. Practical demonstrations of this kind are of far greater assistance than the answering of queries through correspondence, though this has also been done.

Training in Scutching.

I have at present six boys from the Kabete Reformatory being trained in flax scutching, sowing, and retting, and arrangements have been made for flax producers to send in one or two boys for similar training. These are expected to arrive early in April.

Visits.

At the request of several Flax Growers living in the vicinity of Kabete I have visited their farms and advised them as to the management of the crop, retting and scutching, etc.

Seed Testing.

During February and March I have made 21 tests of samples of Seed, mostly sent in by growers or would be growers, who I am glad to see are proceeding on the right lines in making sure of the quality of their seed before using.

Correspondence.

I am continually receiving requests by letter for information of various kinds from local growers, Nyassaland and from other regions outside the Protectorate who are getting alive to the possibilities of the industry. These have all been attended to promptly, but in the case of men who have no practical knowledge it is difficult to give satisfaction by correspondence.

Machinery.

The machinery on the Farm consisted of:—

1 pair set Hand Power Flax Breakers.

1 Treadle Scutching Stock.

1 Dresser Seed dresser.

but as power scutching plant had been ordered and is due to arrive at an early date I have contented myself with scutching only sufficient to examine the quality of the fibre, both that grown on the Farm and samples forwarded to the Farm for report, and to give the demonstrations and training referred to above. When the machinery has come to hand and is put together I hope to be able to have one or two stocks vacant so that students on the Farm and Visitors interested in the industry may take a turn in the actual scutching operation themselves.

My arrival in the country has been so recent I must ask to be excused for the present from expressing any opinion on the general prospects of the industry.

I have the honour to be, SIR,
Your obedient servant,

GEO. M. HAMILTON,
Flax Instructor.

Appendix I.

ANNUAL REPORT

OF THE

Horticulturist

FOR THE YEAR ENDING

31st March, 1920.

The Hon. The Director of Agriculture.

Sir,

I have the honour to submit my first annual report for the year ending the 31st March, 1920.

Appointment.

I arrived at the Nairobi Experimental Farm on December 11th, 1919 on my appointment as Horticulturist.

Tour of Inspection.

On 31st of December I went on a tour of inspection to Mombasa to inspect the Public Gardens there, and also to visit the Government Farm at Mazeras. From thence I proceeded to the Machakos District to inspect fruit farms and more especially to look into the Citrus industry. On January 18th I sent in a report on this tour. On my return to Kabete, I gave six lectures on Horticulture to the soldier settlers. The following were the subjects of my lectures:—

Lectures on Horticulture.

Date.	Subject of Lecture.
January 19.	Tropical fruits and their cultivation. Paw-Paw, Banana, Pineapple, etc.
21.	Tropical fruits, contd. Tropical fruits which might be introduced into B.E.A., such as Durian, Rambutan, Sapodilla Plum, etc.

23.—Cultivation of vegetables.
European and tropical vegetables for intermediate elevations.

26.—Propagation of plants.
Different methods.

28.—Demonstration of Pruning. General principles of pruning.

30.—(*a*) Laying out a garden. Supply of water, preparation of the ground, etc.

(*b*) Transport of seeds and plants.
How they should be packed, etc.

(*c*) Citrus culture. Propagation, budding, grafting, selection of seed. The lime industry in the West Indies.

Work at Kabete.

My work , since I came to Kabete, has been chiefly confined to attending to the Nursery, Orchard, and Citrus Trees.

Orchard.

The Orchard was somewhat overgrown and a certain amount of pruning had to be done, and there are many gaps to be filled in as numbers have died out.

Sugar Cane between rows of Fruit Trees.

Sugar Cane has been planted between the rows of fruit trees, wihch I consider a mistake.

Deciduous Trees.

Apples.—The Apples, which were planted in 1908, have made little progress. I have pruned all the fruit trees heavily in order to get them into a good shape, and to form a good framework.

Plums.—The plums look much more healthy than the apples, and many of them were heavily laden in January. The Japanese varieties, "Satsuma," "Burbank," "Kelsey," and "October Purple" bore heavy crops of fruit. These varieties, I notice, also fruit well in the Machakos District.

Apricots.—The Apricots appear healthy but did not bear any fruit.

Almonds.—The Almonds fruited this year, but the crops were small.

Figs.—The figs bore fruit which was attacked by birds. The roots of some of the trees were also attacked by white ants and borers.

Quince.—The Quince fruited well and bore heavy crops, especially "Cape Selected."

Peach.—The "Angel" variety is the only one which fruited and ripened well. The fruit had a good flavour but the birds attacked the fruit and it was not long before it fell to the ground. "Florida Crawford" had a good crop of fruit but it failed to ripen. Pruning of the roots should encourage the fruit to ripen.

Cherries.—These did not fruit.

Pears.—These did not fruit and many have died.

Citrus.—The Citrus on the whole looks healthy but during the dry season the foliage flagged for some weeks for want of irrigation, for which purpose a water supply was not available. "Thompson's Improved" especially was more noticeable than any of the others. The lemons stood the drought better than the oranges.

Lemons.—Genoa and Eureka lemons fruited well in December and January and the fruit was sent into the European Hospital and Lady Northey's Home each week. They are now beginning to bear another crop. The Grape fruit also fruited well.

Oranges.—All the oranges, especially "Joppa," "Jaffa," "Mediterranean Sweet" and "Ruby Blood" are heavily laden with fruit.

FIVE ACRE PLOT OF CITRUS.

Citrus.—The five acre plot of citrus to the south of the road leading to Nairobi is looking healthy. Many of the trees which were planted in 1917 are now bearing fruit.

Gaps.—There are some gaps to be filled in in this plot. Plants were raised from seed which came from Mazoras. They are a very thorny species and are subject to "Australian bug."

Tahiti Lime.—The Tahiti limes are healthy and are now bearing fruit. The Villa Franca Lemon is doing very well in this plot and is bearing fruit. The original plants came from South Africa.

The following are bearing fruit:—

Tahiti Lime, budded 1915.
Genoa Lemon, budded 1915.
Villa Franca Lemon, budded 1915.
Sweet Rind Lemon, budded 1915.
Lisbon Lemon, budded 1915.

Pruning of Citrus.—The Citrus is now heavily pruned, all dead wood and misplaced branches being removed.

Scale.—Infestations of "purple scale," (Lepidosaphis bichii), "white scale" and "red scale" were found in the Orchard, mostly on the trees of Australian origin. After pruning steps were taken to deal with these pests by spraying and fumigation.

THE NURSERY.

The nursery plots, which had become somewhat overgrown, are now being put in order.

PINEAPPLES.—A plot of pineapples has been planted out from suckers from three different varieties, viz., a West Indian, Smooth Cayenne and a Red variety.

CUSTARD APPLES.—I have cut out two of these in order to leave more space for the others to develop. The others have been pruned.

VINES.—These have been pruned and trained on the fence.

HERBS.—These are being propagated by division and made into plots.

NEW ZEALAND FLAX.—A plot of New Zealand flax is about to be planted from the three clumps in the nursery.

VEGETABLES.—Plots of various European vegetables have been sown.

CORRESPONDENCE.

There have been numerous letters of enquiry seeking advice as to what to plant at different altitudes, also applications for fruit trees.

C. B. USSHER,
Horticulturist.

APPENDIX J.

ANNUAL REPORT

OF THE

Nairobi Experiment Farm, Kabete,

FOR THE YEAR ENDING

31st, March, 1920.

DEPARTMENT OF AGRICULTURE,
NAIROBI EXPERIMENT FARM,
KABETE.
14th February, 1920.

TO THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I have the honour to submit the twelfth Annua lReport on this Farm for the year ending 31st March, 1920.

Weather.

The rainfall for the meteorological 1919 year was 41.73 inches which is 1.58 inches above the average for twelve years. Good rain fell in April and May, but it was only useful for crops that had been planted in March. During September and October in the midst of the harvesting season we had a rainfall of nearly 7 inches, which, from a harvesting point of view, could scarcely be called advantageous. The rain for the second season may be considered to have started in September instead of November. November had a rainfall of 3.81 inches only compared with an average of 5.43 inches.

Underneath will be found Meteorological Tables giving full weather particulars since the Farm was established:—

Table "A."—Meteorological.

Latitude:—1° 14′ 30·94″ S. Longitude:—36° 43′ 31·78″. Height above Sea Level:—6,000 feet.

Month.	Inches Rainfall	Highest Rainfall	Date of highest Rainfall	With 0·01′ or over No. of days	Average Maximum Temperature	Average Minimum Temperature	Average Dry Bulb	Average Wet Bulb	Average Ground Thermometer	
									1 foot	4 feet
1919		Ins.			o	o	o	o	o	o
April ..	7·92	1·24	6th	20	74·30	55·50	63·00	60·20	69·00	71·00
May ...	6·02	2·65	15th	13	72·30	53·80	61·50	58·00	69·70	71·50
June ...	1·67	0·65	19th	10	70·00	50·00	58·80	55·80	64·70	70·10
July ...	3·55	1·80	9th	17	66·00	50·00	55·00	53·60	62·70	67·30
August ...	1·58	0·80	31st	8	72·00	48·00	57·40	54·50	66·50	67·70
September ...	2·89	1·20	25th	9	74·00	52·40	59·78	55·94	67·44	68·76
October ...	4·03	0·75	26th	16	72·00	54·00	60·00	57·56	66·85	68·88
November ...	3·81	1·66	17th	13	72·60	52·10	60·80	58·50	66·97	68·30
December ...	1·14	1·05	8th	4	75·20	49·40	63·10	58·80	68·50	69·00
1920										
January ...	1·74	1·49	1st	2	77·94	47·97	64·27	58·98	70·03	70·19
February ...	·10	·10	1st	1	81·00	46·80	64·57	56·19	71·51	71·86
March ...	10·85	1·58	28th	19	77·42	53·00	62·52	58·03	68·94	71·40
Totals ...	45·30	...	...	...	884·76	612·97	730·75	686·10	812·84	835·99
Averages ...	...	...	...	...	73·73	51·08	60·89	57·17	67·73	69·67

Table "B."—Meteorological.

	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.	1917-18.	1918-19.	1919-20.
Rainfall	34·22″	31·67″	54·34″	51·17″	34·04″	37·62″	41·07″	54·85″	40·67″	37·05″	45·30″
Number of days with rain	...	129	143	148	143	112	127	166	96	112	132
	Nov.	May	Feb.	April	March	April	April	April	April	April	March
Wettest month with rainfall ...	7·99″	5·96	13·06″	12·19″	9·09″	10·00″	8·85″	13·52″	16·08″	9·85″	10·85″
MEAN.											
	o	o	o	o	o	o	o	o	o	o	o
Dry Bulb ...	61·90	63·60	61·90	62·10	61·60	63·10	63·30	62·50	60·90	60·70	60·90
Wet Bulb ...	56·70	56·30	56·80	57·60	56·90	58·40	59·40	58·40	58·00	57·30	57·20
Maximum Thermometer	73·90	72·80	73·50	72·60	73·60	74·90	74·10	71·90	73·10	73·50	73·70
Minimum Thermometer ...	51·80	50·10	51·60	51·70	52·50	53·00	51·70	51·00	50·10	52·50	51·10
Ground Thermometer 1 foot	...	...	...	68·30	68·50	69 90	69·50	67·20	67·40	68·10	67·74
Ground Thermometer 4 feet ...	...	...	...	69·30	69·50	70·80	70·70	68·50	68·50	69·50	69·67

Staff and General.

I returned to this farm from Naivasha about the middle of May, when Mr. McNaughton, who had been Acting Manager in my absence, resigned Government Service. Mr. Simpson carried out the duties of Flax Instructor till December, went on leave on December 8th, and resigned Government Service.

Mr. Ritchie, Clerk, went on leave on December 8th. Mr. J. Greig was appointed temporarily Assistant from June 7th to December 8th. Mr. A. J. Wilson arrived on the Farm on December 11th and will be Acting Manager during my absence on leave.

Mr. Ussher came as Horticulturist on December 11th.

Mr. Hamilton arrived on the 10th December to take up the duties of Flax Instructor vice Mr. Simpson, resigned.

Messrs. Sparrow and Butler arrived on the Farm on February 2nd on first appointment as Agricultural Instructors.

Mr. E. W. Hobson has been appointed temporarily Clerk during the absence of Mr. Ritchie on leave.

These changes in staff rendered continuity of experimental work practically impossible.

Settlers' Lecture Course.

It was expected that a large influx of Ex-Soldier Settlers would arrive in East Africa by the Garth Castle during December, 1919. A Hostel had been erected early in the year for the accommodation of Ex-Soldiers, as a memorial to the late Messrs. Alan Thompson and R. W. Lambert.

The course provided general instruction on the Agriculture and Stock of the country and given to "settler students" during the month of January.

The average attendance at the lectures and demonstration was fifteen.

Revenue.

The Revenue for this Farm for the year ended March 31st, 1919, was Rs. 60,500.

Crops.

A limited amount of experimental work has been carried out in wheat, flax, beans, peas, and rotations, and all the land, about 200 acres, has been twice cropped during the year.

Maize.

Forty acres of Maize were planted during the first season, two different varieties on two different plots. Both these were planted late, and the yields of

1,100 lbs. per acre, Iowa Silver Mine,
800 lbs. per acre, Hickory King,

cannot be considered satisfactory. Late in planting meant late in harvesting, which made it difficult to get the second season's crops planted in time. In November, 1919, 29 acres of a quick growing hybrid Maize were planted. It suffered severely from an attack of cutworm and the yield was

31,833 lbs., or 1,097 lbs. per acre.

Flax.

Eleven acres were planted in the first season. One plot of five acres was ploughed in and replanted owing to its having been very badly attacked by caterpillar. A certain proportion of this second sowing germinated at once, but the remainder did not germinate until three weeks later, when a useful shower came along. A certain amount of good seed has been secured from it, some of which has been distributed and the remainder will be distributed this season. The other plot was also badly attacked by caterpillar and several different spraying experiments were carried out.

In the second season five acres of old imported seed were sown and five acres of our own seed. The germination of the latter was very good, but of the former indifferent. This has all been harvested and is now being de-seeded and should be available for distribution these rains.

On December 19th caterpillars were noticed on the Flax and experiments were made to combat the pest. A rope 30 feet long dragged across a portion of the field eight times a day considerably reduced the number of caterpillars compared with a control area not roped. A brush drag, consisting of thorns tied to a bamboo six feet long, was also tried, but this was slower and did more damage to the crop, while the reduction in the numbers of the caterpillars was no better, if as good, than with the rope.

Wheat.

During the first season the following varieties were planted, and the respective yields are given:—

1 acre Cross No. 11. Yield per acre ...	... 240 lbs.
1 acre Florence. Yield per acre ...	... 600 lbs.
1.55 acres cross No. 13. Yield per acre ...	... 480 lbs.
3 acres Kabete Selected. Yield per acre	... 316 lbs.
2 acres Cross 10/7. Yield per acre ...	... 340 lbs.
2 acres Cross 13/5. Yield per acre ...	... 430 lbs.
1 acre Indian No. 17. Yield per acre ...	... 80 lbs.

The weather suited this crop extremely well up to a certain point. The straw was long and strong with well developed heads on all varieties. Rust subsequently attacked in places, but not so as to destroy the yield appreciably. Birds were numerous. In fact, they have never been worse, and affected the yield considerably, which is to be expected where we have different varieties on small plots ripening at different times.

During the second season we planted:

	Yield per acre.
5 acres Florence ...	... 222 lbs.
5 acres Cross No. 13 ...	... 160 lbs.
2 acres Kabete selected	... 150 lbs.
8 acres Cross No. 10/7	... 48 lbs.
15 acres Cross No. 13/5	... 93 lbs.

All the plants have suffered from drought to a certain extent, but while the straw is short they give great promise of yielding a quantity of sound well developed seed. There has been a complete absence of birds this second season.

Beans and Peas.

During the first season the following Beans and Peas were sown:—

Description.	Acreage.	Yield lbs.	Yield per acre.
Broad Beans ...	... 2 ...	600	... 300
Rose Coco Beans ...	... 7 ...	2575	... 368
Canadian Wonder	... 6 ...	1056	... 176
Noyau au Blanc ...	... 4 ...	737	... 184
Braila Flat White	... 2 ...	Failure	
Peas. Telephone ...	... 2 ...	380	... 195

The Rose Coco did best. The Braila Flat White was sown late and owing to the peculiar nature of the season under review and the late rain in September and October rusted badly; it was therefore ploughed in as green fodder and not harvested.

Rape.

Two acres were planted on 12th April and have yielded a very large quantity of green fodder for the pigs and bulls, and a considerable quantity of seed has been saved for planting again.

Potatoes.

Two varieties were planted during the first season:—

Early White—1 acre yielded 7209 lbs.

King of Early—2 acres yielded 13712 lbs.

A quantity of these have been distributed throughout the country and the remainder used for feeding experimentally and otherwise.

Stock.

The health of the stock was fairly good during the greater part of the year, but during the month of August we had an exceptionally bad outbreak of East Coast Fever and we lost heavily in spite of the fact that the cattle were being dipped regularly every 72 hours in a normal three days dip.

Our sheep are mainly grade mutton and give promise of doing very well in this district with proper attention.

Pigs.

An outbreak of lung sickness occurred amongst the young stock in August last, causing the loss of a number of very valuable pedigree stock. Healthy animals were inoculated by the Veterinary Pathologist and the sickness proved not to be contagious. It disappeared as suddenly as it began and there has been no further trouble.

Nursery and Small Plots.

A large area of small plots of wheat and flax were planted for fertility and quantity seed tests during the first season.

During the second season this area was cut down very considerably, but a number of wheat plots were sown by the Mycologist, and the following varieties were planted:—

Variety.	Yield.	Yield per acre.
Australian, 2 plots	9 lbs. ...	405 lbs.
No name, 2 plots		
Bobs x Rieti (Ridgill), 2 plots		
Heatley's White, 2 plots	6 lbs. ...	270 lbs.
Union 31, 2 plots	6 lbs. ...	270 lbs.
Union 52, 2 plots	7 lbs. ...	315 lbs.
Gluyas Early, 2 plots	11 lbs. ...	495 lbs.
Selection 10-1, 2 plots		
Rieti X., 2 plots		
Lang Koren, 2 plots	2 lbs. ...	90 lbs.
Golden Ball, 2 plots		
Neapolitan, 2 plots	5½ lbs. ...	247 lbs.
Cross 15/1, 2 plots	5½ lbs. ...	247 lbs.
Smith's Earliest, 1 plot		
Early Rieti (Theanissen), 2 plots		
Spring, 2 plots		
Flourie, 2 plots	5 lbs. ...	225 lbs.
Cherouka, 2 plots		
Warren, 2 plots	9½ lbs. ...	427 lbs.
Firbank, 2 plots	5 lbs. ...	225 lbs.
Cross 12/1, 2 plots	3¾ lbs. ...	168 lbs.

Department of Agriculture,
Nairobi Experiment Farm,
Kabete.
17th April, 1920.

The Hon. The Director of Agriculture,
Nairobi.

Sir,

I have the honour to forward Mr. Johnston's Report up to the 14th February last and my own in continuation of his up to the end of the year under review. My report is mainly recording the harvest yields which have accrued since Mr. Johnston's departure.

Weather.

At the time of Mr. Johnston writing his report the rainfall had been under the average of the previous 10 years for the equivalent period, but the heavy rains during March brought the total for the year 3.63 inches above the annual average. As will be seen from the Meteorological Tables. March was the wettest month of the year, an event which has only happened once previously since the Farm was established. This fact has been accountable for very considerable damage to crops both before and during harvesting.

Staff.

Since I took over the farm on the 21st February, Mr. C. B. Armstrong has been transferred from Naivasha to Kabete as Assistant Manager.

Wheat.

The expectation regarding the yield of wheat was not fulfilled as concerned quantity, on account of the very adverse conditions which prevailed during the ripening and harvesting. Before the grain could be threshed out on the plots which carried Varieties Nos. 10/7 and 13/5 the rains were so heavy and continuous that nearly half the crop was lost through germination of the grain in the stock. In this respect Cross 10/7 was most affected.

Beans.

Only one acre of Beans were grown this past season. These were Rose Coco on the 5 year Rotation Experimental Plot and yielded 376 lbs. per acre.

Potatoes.

The following returns are to be recorded from the two varieties of potatoes planted:—

Variety.	Acreage.	Yield.	Yield per acre.
King of Early	2	11,062 lbs.	5,521 lbs.
Early White	1	1,578 lbs.	1,578 lbs.

In addition to the above 1,796 lbs. of King of Early Potatoes were harvested from the 5 year Rotation Experimental Plot. These yields are very unsatisfactory in comparison with the previous season's returns and in all probability are due to the drought prevailing during January and February.

A very large percentage of the tubers were small and of seed size. They were harvested under good weather conditions, but have stored very badly on account of some rot disease, which is now being investigated by the Mycologist. The disease was more prevalent in the smaller tubers and more particularly in the King of early variety. Prior to the discovery of the disease one sale of seed potatoes had been effected, but all sales have been stopped since the disease was noticed.

Flax.

The six acres of Flax sown with Kabete grown Dutch seed have yielded:—

	Yield.	Yield per acre.
Seed	720 lbs.	120 lbs.
Flax Chaff (suitable for feeding)	672 lbs.	112 lbs.
Dry and Deseeded Straw	4 tons 10 cwt.	15 cwt.

The retting at the time of writing has not been completed but owing to the partial failure of the rains and the crop being considerably below the average both in seed and straw a low yield of fibre must also be expected.

The five acres sown with Government imported seed yielded:—

	Yield.	Yield per acre.
Seed	865 lbs.	163 lbs.
Flax Chaff	750 lbs.	150 lbs.
Dry Deseeded Straw	4 tons 5 cwt.	18 cwt.

Owing to the bad germination this crop was very thin resulting in the straw being coarse and uneven. It was also attacked by caterpillars. The retting has not yet been completed, but a good crop of Flax cannot be expected.

Correspondence.

1,146 letters were received and 1,104 despatched during the year.

Pigs.

There has been considerable enquiry for pure bred pigs, which I understand has existed for a considerable period, the supply not being adequate to the demand.

Stock on hand.

The Farm was carrying at the end of the year:—

Cattle	...	140
Sheep	...	91
Mules	...	4
Horses	...	2
Pigs	...	42
Total	...	279

Classification of Stock.

The above-mentioned stock are as under:—

Pure Bred Ayrshire Bulls		...	2
Pure Bred Ayrshire Cows		...	2
Pure Bred Ayrshire Heifers		...	1
Pure Bred Friesland Bull		...	1
Pure Bred South Devon Cow		...	1
Pure Bred Red Poll Cow		...	1
Cross Ayrshire and Red Poll Bull		...	1
Cross South Devon and Red Poll Bulls		...	2
Cross South Devon and Red Poll Cows		...	1
Cross Ayrshire and South Devon Cows		...	1
Grade Cows.	Red Poll Cows	...	25
	Red Poll Heifers	...	9
	Friesland Cows	...	6
	Friesland Heifers	...	8
	Ayrshire Cows	...	3
	Ayrshire Heifers	...	4
Grade Bullocks	... ...	...	5
Working Oxen	... ...	...	67
Mules	... ...	...	4
Horses	... ...	...	2
Grade Sheep	... ...	...	91
Pigs. Berkshires.	Boars	...	2
Berkshires.	Sows	...	7
Long Blacks.	Boars	...	2
Long Blacks.	Sows	...	4
Long Blacks.	Young	...	3
Tamworths.	Boars	...	1
	Sows	...	6
	Young	...	2
Cross Breds		...	15
	Total	...	279

The following amounts of Coffee were gathered during the season :—

From plantation at top of Ridge.	Coffee.	6,540 lbs.
	Buni	3,982 lbs.
From Plot 12	Coffee.	5,030 lbs.
	Buni	2,946 lbs.

I have the honour to be,
SIR,
Your obedient servant,

A. J. WILSON,
Acting Manager.

APPENDIX K.

ANNUAL REPORT

ON THE

Government Experimental Farm, Kibos,

FOR THE YEAR ENDING

31st March, 1920.

THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I have the honour to submit my Annual Report on the Government Farm, Kibos, and the Agricultural Instruction work carried out by me in various parts of the Nyanza Province for the year ending 31st March, 1920.

Staff.

The staff was the same as in previous years. The volume of work has increased steadily.

Rainfall and Weather Conditions.

Speaking generally the weather conditions during the year were nearer normal than they have been for years, this fact being reflected in the bumper crops produced both at Kibos as well as throughout the Nyanza Province.

On the flat and somewhat heavy lands at Kibos 40 inches of rain, even distributed with that irregularity so characteristic of the rainfall of the district, have been found ample for the production of big crops of grain. But during the year under review, as the table below shews, it was affected with even less than 40 inches; this, of course, after deducting the 7.22 inches recorded in March, which was subsequent to the crop under review.

One very severe hailstorm was recorded during the year, but occurring as it did at the beginning of the short rains before the crops were planted, fortunately no serious damage was done.

The rainfall for the year was as below:—

Month, 1919	Quantity in inches	No. of days on which rain fell	Greatest fall in inches	Date
April ...	4·69	10	1·27	22nd
May ...	6·05	14	1·00	18th & 21st
June ...	3·17	6	1·68	15th
July ...	4·10	8	1·20	22nd
August ...	1·26	5	·66	26th
September ...	1·91	7	·40	2nd & 23rd
October ...	3·59	8	1·56	1st
Nobember ...	6·50	11	1·20	4th
December ...	5·06	7	1·90	13th
1920				
January ...	·75	4	·33	4th
February ...	1·45	3	·70	28th
March ...	7·22	9	1·26	9th
Totals ...	45·75	92	—	—

Buildings.

Extensive repairs were carried out on the Farm Bungalow. A deposit of excellent clay containing just what is said to be the right proportion of sand in it, has been discovered on the farm and arrangements are in hand to utilize this for the purpose of providing a large supply of bricks with which to erect the necessary farm buildings.

Nursery.

Owing to the great size which the Jamaica Rain Trees (Pithecolobium Saman) planted some 7 years ago to provide shade in the old nursery developed, and the consequent difficulty of admitting the necessary amount of light to the seed beds, steps were taken to extend the small nursery started in the previous year on the north boundary of the farm adjoining the Kibos river.

Although shade is an absolute necessity in successful nursery work at Kibos, easy facilities for admitting sunlight to the seed beds are of equal importance. The kind of structure used for this purpose is ordinary grass covered wooden frames erected sufficiently high to allow of beds being easily watered when necessary. The great drawback to such a structure is the high cost of repairs, which become so frequently necessary owing to the rapid decay of the wooden uprights. These might, perhaps, be replaced by iron.

Crop Experiments.

In most important particulars the above were conducted along the same lines as in previous years. That is to say, field trials were carried out with a number of crops to test their suitability to the conditions of the district.

Through the courtesy of the Manager of the Kibos Estate, who presented the farm with a small collection of seed including several varieties of Sorghums, Wheats and Groundnuts imported from India, a small increase was recorded in the number of crops experimented with during the year. This increase was, however, offset by the curtailment which it became necessary to make in certain other experiments, such as seed selection, budding, grafting, etc., on the departure of the majority of the school pupils following the completion of their apprenticeship period. Amongst the crops tried are the following:—

Short Crops.

Beans.
Cotton.
Maize.
Sim Sim.
Tobacco.
Chillies.
Groundnuts.
Rice.
Sugar Cane.

Chillies.

The long Mombasa variety of this crop still continues to occupy an important place amongst the crops exported from Kibos. Most of it being sent to Nairobi and Mombasa, where it is disposed of at prices ranging from Rs. 6/- to Rs. 8/- per frasila of 36 lbs. Several inquiries were received during the year re the suitability of Chillies as a catch crop with Coffee, but as there is no data to hand regarding the yield of the crop in the recognised coffee areas it was difficult to give any definite opinion in the matter. Based on the conditions existing at Kibos it may be useful to quote the following points in favour of the long Mombasa variety. It is a short crop —5 months, of bushy habit of growth. Easy to cultivate and in normal years produces 10 to 12 frasilas per acre.

No fresh plantings were carried out with the small Jinja Chillies, the small previous experiment having been allowed to continue to test the yield of the trees as a perennial.

TABLE OF RESULT.

Variety.	Date of planting.	Date of harvesting.	Yield per acre.
Mombasa ...	20th April ...	31st July ...	360 lbs.
Nyassaland ...	1st May		Proceeding.

Beans.

T is experiment included the same varieties as on the previous years, viz., Haricot, Rose Coco and Canadian Wonder. It is possible that a higher yielding variety may yet be found for trial at Kibos, but eight years trials have shewn that even under the most suitable conditions neither of the above varieties produces yields high enough to commend them for European cultivation as a main crop where the conditions are similar to those at Kibos. Argument in favour of the cultivation of Beans, however, whether as an intermediate or a catch crop is its manurial qualities.

It will be seen from the table below that the Haricot variety comes last in yield, but it is, however, generally accepted as possessing the best table qualities.

TABLE OF RESULTS.

Variety	Date of planting.	Date of harvesting.	Yield per acre
Canadian Wonder ...	5th Sept. ...	11th Dec. ...	648 lbs.
Haricot ...	8th Sept. ...	12th Dec. ...	485 lbs.
Rose Cocos ...	8th Sept. ...	14th Dec. ...	520 lbs.

Cotton.

The success of this experiment was seriously interfered with through a failure to obtain a supply of good reliable seed for planting purposes—the export of seed from Uganda having at the time being prohibited. A small quantity of seed, taken from selected trees shewing good vegetative characteristics in the previous year's crop, sufficient to plant half an acre, was used, and the remainder of the four-acre plot, which had been prepared for the purpose, planted with seed obtained from Uganda two years previously. The difference in the results produced by the plants grown from selected seed and those grown from old seed further emphasised the necessity so often advocated of using only fresh selected seed if the best results are to be obtained.

Heretofore cotton was not considered a suitable crop for European cultivation in the Province, owing to the very low prices paid by the Ginneries for the seed cotton, but at present prices—15 to 18cts. per lb. of clean unginned cotton—the cultivation of this crop in suitable parts would appear to have become worthy of closer attention. Since discarding the Egyptian Abassi variety some 7 or 8 years ago, owing to its poor yield, the experiments at Kibos as well as in the Native Reserve have been confined to one variety only—an American Upland, probably Sunflower. Until a more extensive series of variety experiments be undertaken the question as to the variety best suited to the conditions obtaining in the cotton areas of the district must remain a matter of uncertainty.

TABLE OF RESULTS.

Variety	Date of planting.	Date of harvesting.	Yield per acre.
Sunflower fresh seed	12th April	Aug.-Oct.	492 lbs.
Sunflower old seed	14th April		110 lbs.

Groundnuts.

This experiment was conducted as a catch crop between rows of Bananas and included the following six varieties:—

Big Japan.	Pondicherry.
Small Japan.	Spanish Peanut.
Mauritius.	Shirati.

The quantity of seed planted with the first five varieties was too small to allow of any definite or reliable opinion being formed regarding their yield. The Big Japan variety was distinct both in habit of growth, which was erect, and size of nuts, which was much bigger than others. All the others which were very like Shirati—the variety which has been under trial for years at the Farm—grew fairly vigorously, the Spanish Peanut variety being the only one which shewed signs of the yellowing disease towards the end of the crop. On the heavier lands at Kibos, the cost of preparing the land into a state of tilth suitable for the production of good crops is rather high, the seed having to be sown on raised beds. There are, however, large stretches of sandy and friable loams in various parts of the Province where the crop would grow luxuriantly and yield heavily under normal rainfall conditions.

Attention has been repeatedly drawn to the value and usefulness of this crop as a catch crop between coffee, especially as an agent for saving wash on sloping lands.

There is a tendency towards the revival of this industry by the Natives. The applications for seed being more numerous than has been the case for many years.

TABLE OF RESULTS.

Variety	Date of planting	Date of harvesting	Yield per acre
Big Japan	4th May	10th Oct.	No return available
Small Japan	4th „	10th „	(see notes above)
Mauritius	4th „	10th „	„ „
Pondicherry	4th „	10th „	„ „
Spanish Peanut	4th May	10th Oct.	
Shirati	7th „	26th „	1162 lbs.

Maize.

T e trials with this crop this year included for the first time the Natal White Horsetooth variety, the object being to compare it with Hickory King. It is early yet to judge the general field and cropping qualities of this Maize compared with the other, but if sturdy growth and early maturing qualities count for much these were exemplified in a remarkable manner. There are so many good points connected with Maize as a general utility crop for Kibos that despite the vicissitudes to which the crop has been subjected during the past ten years, such as abnormal rainfall and excessive droughts, it still continues to occupy the foremost place amongst the export crops from Kibos.

Efforts still continue to be made to improve the Native varieties of Maize so largely grown in various parts of the Province. In certain parts, the Native varieties have gradually disappeared and one or other of the pure bred varieties substituted for it. The Hickory King variety has now completely replaced the yellow variety at Kibos for export purposes, though a certain quantity of yellow maize is still being grown by the Indians, who prefer the flour of the yellow varieties for food purposes.

Rice.

For the third season in succession this experiment produced rather poor results, the cause, however, on the present occasion being due, not to weather conditions as heretofore, but to a tremendous swarm of caterpillars and grass-hoppers, which damaged the plants to such an extent that though these pests were ultimately got under by the use of Paris Green and Lime, the plants failed to develop grain, of which, judging from the profuse manner the plants flowered, there would have been under normal conditions a fairly heavy crop. This refers to the Upland variety, which included several kinds introduced from the Coast through the agency of the Government Analyst on the previous year.

Owing to the high cost and difficulty which would be entailed in irrigating the fields from the Kibos river, no experiments with the swamp varietes of Rices have so far been undertaken on the Farm, but the crop is still grown on a fairly large scale in suitable parts of the North Kavirondo district by several Chiefs and Headmen.

The experience with this crop at Kibos is that, given warm, humid climatic conditions, a retentive subsoil and from 25 to 30 inches of rain fairly evenly distributed from date of planting to the ripening of the seed, say over four months, crops varying from 1500 to 2000 lbs. of Paddy (unhusked rice)per acre can be raised. At the time of writing the 1920 experiment at the Farm promises to yield at the above rate.

Sim Sim.

One acre was put under with this crop with a view to furt' er testing the best time for planting at Kibos. Previous experiments had shewn that it was possible in normal years to raise 2 crops at Kibos. In the recognised Sim Sim areas of the Province, the crop is usually planted in the short rains.

Sowings carried out in the long rains having a tendency to develop bush at the expense of fruiting.

Enquiries have been received from various quarters re the suitability of this crop for European cultivation, but, whilst owing to its low yield it cannot be recommended as a main crop it should prove very valuable and useful as a short crop planted during the short rains on new land which had been prepared for planting coffee in the following long rainy season.

The experience with Sim Sim at Kibos shows that under careful treatment the crop will give a yield of from 10 to 12 frasilas per acre in normal years, planted in August and September. The crop takes three to four months to mature and there is always a ready sale locally at prices ranging from Rs. 4/50 to Rs. 6/- per frasila of 36 lbs.

Variety	Date of sowing.	Date of harvesting.	Yield per acre.
Brown imported ...	10th Sept. ...	14th Dec. ...	260 lbs.

Sugar Cane.

It would be no exaggeration to say that this experiment was the means of attracting more people to Kibos than has been the case with all the other crops put together, and the fact that a considerable portion of the writer's time was spent either replying to letters, or giving information on the spot regarding the general cultivation of the crop is proof of the remarkable manner in which interest is growing in the possible development of a sugar industry in the Protectorate.

Of the three seedling varieties introduced for trial some four years ago, Sealy Seedling, of which sufficient plants were raised from the original cuttings to plant an acre, maintained its record for vigorous growth, and runs the Uba, which holds premier place, very closely for field qualities generally.

The two other varieties, B.3922 and B.1528 have not proven very satisfactory, being slower of growth and altogether more difficult to establish.

At the time of writing the plot of plant canes furnishes a useful demonstration as to the suitable distance to plant at Kibos, 5 ft. x 5 ft., and the value of clean cultivation during the early growth of the canes.

The average number of canes per hole in the plot at time of writing 20 months from date of planting is as follows:—

Uba	67
B. 1528	27

The average weight of the canes being:—

Sealy Seedling	3 lbs.
Uba	1¾ lbs.
B. 1528	2 lbs.

At Kibos the foundation of what is hoped will be developed into an area large enough for a modern factory's requirements was laid during the year, when some six hundred and forty acres were cleared and practically all planted up with the Natal Uba and a Striped Ribbon variety known locally as Kampala Cane.

Tobacco.

Failure of the effort made to obtain a fresh supply of seed in time for sowing, necessitated the curtailment of this experiment from four varieties to two during the year, viz. Gold Finder and Raglan Conqueror. The seed was sown in nursery beds in the middle of February and the seedlings transplanted to the field six weeks later. The treatment of the crop in the field was more or less the same as on previous years. Planting out being done in rows 3 ft. apart and 18 inches from plant to plant. Owing to a difficulty in draining the plot in which the experiment was carried out a fairly large proportion of the plants were stunted in growth but those not affected by standing water developed some excellent leaves.

The method of harvesting employed was different to that used in previous years. That is, instead of cutting down the whole plants the leaves were removed as they ripened taken to the drying shed where after being allowed to lay in piles of forty leaves overnight they were strung together and hung up till dried.

For choice tobaccos the soil conditions are not considered suitable but for strong mixtures for pipes and cheap cigarettes this crop offers great possibilities at Kibos and similar sections.

Variety	Date of planting in field	Dat of harvesting	Yield per acre.
Gold Finder	10th April	14th July	612 lbs.
Raglan Conqueror			432 lbs.

Permanent Crops.

No new additions were made to the above during the year, which include the following in various stages of development.

Bananas, Coffee, Citrus, Cocoanuts, Guavas, Mangoes, Pa-paws, Pineapples, Cashew nuts, Sugar Apple and various species of Timber Trees.

Bananas.

A further reduction of the banana shade in the old Coffee plot enabled the planting up of the new banana plot adjoining the fruit orchard to be carried out. The varieties thus being established in the new plot include:—

1. Lady's Finger or Zanzibar Banana.
2. Guindy or Sukari Banana.
3. Imported No. 1.
4. Uganda Mtoke or Kavirondo Banana.
5. Pokoma (Short Plantain).
6. Tembe or Long Plantain.

The dwarf Chinese Banana was lost and the Purple Banana of Uganda deleted from the list, having been found unsitable to the conditions at Kibos. The Lady's Finger still leads the way both as regards growth in the field and flavour of fruit. Though the Guindy is said to shew a better record in the high altitudes.

Coffee.

The way in which the Coffee trees in the plot near the river recovered themselves from the damaging effects of the drought of the previous year was most remarkable. At one time all the trees in the four year old plot looked so much like dry pieces of sticks that the advisability of digging them out and discarding this portion of the experiment was seriously considered. But, so rapidly did they recover after the first few inches of rain that attention had to be quickly diverted to the pruning of the profuse suckers which were thrown out, and it is believed that this operation, together with the digging in of green dressings has been largely responsible for the excellent crop of Berries which the trees are carrying at the time of writing.

Although the altitude, somewhat flat and heavy lands at Kibos as well as the climate on the plains were not considered suitable for the successful cultivation of the Arabian type of coffee, the present experiment would seem to offer very powerful argument to the contrary. Arrangements are in hand for making a record of the yield of a number of trees of various ages during the present crop.

Coconuts.

The three older trees of the above continue to produce a fair crop of nuts, but though they have shewn distinct signs of improvement both as regards number and size of the nuts, these trees have not yet reached that standard in either of these respects possessed by trees of similar age, 12 years, at the Coast. Two of the 7 year old Palms commenced flowering during the year. This coincides with the time they reach this stage on the Coast, but differs in that none of the flowers of the first flowering develop fruit.

Guavas.

The Guava plants in the fruit orchard made excellent growth and produced a heavy crop of fruit.

In the West Indies this fruit is very much prized for jams and jelly making and in certain islands forms a very valuable minor industry.

In view of the ease with which the plants grow and the prolific nature of the crops they generally produce, it is surprising that more attention has not been given to their cultivation in suitable parts of the Province.

Citrus.

These include several vaireties, mostly imported, of oranges, lemons, limes and grape fruit.

A striking feature of the experiments with these fruit trees was the susceptibility of certain varieties to brown scale attack—the Mediterranean Sweet orange, practically all the lemons (except the Rough Lemon) and the Tahiti limes to a lesser extent.

The Mandarin oranges, Navel oranges, the Dominica limes and the Grape Fruit were comparatively immune.

The Navel oranges continued to fruit somewhat poorly whilst all the others showed an improvement to the previous year, when a fairly heavy crop was produced. The age of the Citrus trees in the fruit orchard varies from eight to five years.

Mangoes.

The three trees in the bungalow compound planted some twelve years ago continued to flower freely, though the fruiting is still very indifferent, and bears striking contrast to the younger trees—7 years old—in the fruit plot, which gave big crops of fruit during the year. It is very probable that the poor fruiting of the older trees may be due to the fact that they were planted too close in the first instance.

It is hoped to introduce additional good varieties of Mangoes.

Papaws.

Owing to the deterioration in size so characteristic of this fruit when the trees have passed the 5th year, all the trees passing this age in the fruit orchard were dug out during the year and vacancies so caused filled in with young plants from the nursery.

Pine Apples.

The plants in the pinery received so severe a check in the drought of the previous year that as in the case of the coffee it was feared, at one time, that the majority were past recovery, but though they did little beyond keeping alive during the year, three varieties are, at the time of writing, rapidly resuming their one time vigour and healthy appearance, viz: Smooth Cayenne (which had established a reputation both for size of fruit and delicacy of flavour), Queen, a smaller pine, equally delicious, but much less juicy, and the native Mombasa pine, hardier than any of the others, though not so palatable.

Charlotte Rothschild, a smaller pine than any of the others, was never perfectly at home and was lost as a result of the drought.

Cashew Nuts.

A fair crop of fully matured but rather small fruit was produced by the two established trees in the fruit plot. This fruit is not a great favourite among tropical fruits, though the kernels of the roasted nuts possess a rather superior flavour somewhat resembling the English almond.

Sugar Apple.

The 4 trees which have all reached the bearing stage were badly attacked by scale during the dry months of January and February, recovered during the rains, and, at the time of writing, have developed a few good sized fruits which it is hoped to utilize for raising a fresh stock of plants.

Before leaving the subject of fruits, I should like to emphasise the urgent need that exists for extending this branch of work. The Kavirondo country is remarkably deficient in good tropical indigenous fruit and thus opens a splendid field for development work. Any expenditure or efforts towards this end, therefore, cannot fail to be of considerable benefit.

Timber Trees.

If the present dearth of timber for building puposes and for fuel purposes, a dearth which has been felt more and more each succeeding year at Kibos since the place has become more or less thickly settled, were alone considered, that is, irrespective of the increasing demand for seed from various parts of the Nyanza Province, especially the Kano, Gem and Seme locations, the establishment of the plot of Timber Trees at the farm would seem to have been fully justified.

For temporary farm buildings, etc., also in demonstrating the kind of trees suited for rapid establishment under conditions such as those at Kibos, this plot has undoubtedly fulfilled its purpose.

The following trees used for timber purposes of one kind or another are now fully established at the farm:—

1. Eucalyptus citriodord.
2. Grevillea robusta.
3. Casuarina equisitifolia.
4. Cassia florida.

also

5. Pithecolobium saman (Rain tree).
6. Adenanthera pavonina.
7. Tectona grandis.

Labour.

The supply of voluntary labour has been plentiful though the tendency has been to demand higher wages. The current rate at present for the district is from Rs. 5/- to Rs. 7/- with posho for able bodied men, the majority coming from the North Kavirondo district.

Visitors.

Settlers, Officers of the Department and Officers of the Administration paid visits to the farm during the year.

Distribution of Plants, Seeds, etc.

The work done under this head had to be somewhat curtailed owing to the failure of the short rain crops in the previous year, which not only affected the supply of seed available for distribution, but necessitated the use of a quantity to meet the posho requirements of the farm. If there was a curtailment in quantity the range and variety of plants and seeds, etc., remained the same as heretofore and included the following:—

Banana Suckers	610	
Sugar Canes	3000	
Limes	30	
Giant Papaws	12	
Upland Rice Seed	312	lbs.
Swamp Rice Seed	360	lbs.
Beans, Canadian Wonder	412	lbs.
Hickory King Maize	3	tons.
Mombasa Chillie Seeds	47	lbs.
Sim Sim	180	lbs.
Tobacco Seed	2	lbs.
Eucalyptus Seed	3	lbs.
Iron Wood Seed	8	lbs.
Cotton Seed (selected)	30	lbs.
Hedge Plants (including Duranta, Barbados Pride and Barbados Bread and Cheese)	2	lbs.

Agricultural Instruction.

This embraced the instruction of Natives on the farm in practical agriculture, care being taken to confine the instruction to such branches of work as would fit them for work on farms or to help in the development of local agricultural industries.

Several Agricultural tours were made by the writer in the Native Reserves, including a somewhat extended one in the Kisii district, to investigate the possibilities for Rice, Cotton and Groundnuts.

The visits to the settled areas were mostly in the Muhoroni district in connection with sugar cultivation.

Several boys were sent to the farm by planters from time to time to get an insight into the way in which Coffee should be pruned.

I have to acknowledge the valuable help given and ready assistance rendered by the various District Officers in the agricultural instructional work.

I have the honour to be,

Sir,

Your obedient servant,

H. H. HOLDER,

Plant Instructor.

Appendix L.

ANNUAL REPORT

ON THE

Government Farm, Mazeras,

FOR THE YEAR ENDING

31st March, 1920.

Government Farm, Mazeras.
31st March, 1920.

The Hon. The Director of Agriculture,
Agricultural Department,
Nairobi.

Sir,

I have the honour to submit the 12th Annual Report on the Government Farm, Mazeras, together with a brief report on the coconut beetle traps for the year ending 31st March, 1920.

Staff.

During the month of August I was instructed to resume charge of the Government Farm, Mazeras, in conjunction with my duties in connection with the coconut beetle traps, owing to the retirement of the late Chief of the Economic Plants Division.

In September the Overseer resigned this post and another person was taken on in his stead.

Rainfall.

The following rainfall was registered at Mazeras:—

1919.	
January	0.97
February	0.00
March	6.75
April	2.34
May	2.93
June	3.90
July	3.84
August	3.48
September	1.20
October	4.94
November	1.00
December	3.55
1920.	
January	0.00
February	0.00
March	1.33
Total Calendar year	34.90 ins.
Total Fiscal year	28.51 ins.

Mazeras, with an average annual rainfall of 50.92 ins. over a period of 13 years thus shows a deficiency of 16.02 ins. for the calendar year 1919.

A comparison with monthly averages indicates the rainfall for March, August and October as 3.46 ins., 1.41 ins., and 0.15 ins. above normal. With these exceptions the rainfall was for the year subnormal and there have been but two months of November with less than 1 inch of rain in the sixteen seasons of record at this station.

The greatest daily rainfall recorded during the year 1919 was 2.10 inches on 10th August, and 81 days of rain were recorded.

Labour.

The labour supply was most unsatisfactory, being very limited, irregular and unreliable.

Buildings.

Certain repairs were effected in connection with the caretaker's house and the water tanks which adjourn the storehouse.

The pergola at the entrance near to the Rabai Road was blown down and a new one erected.

Drains.

Repairs, where necessary, were effected and in addition to those already existing new drains were opened up along the new road.

Water Supply.

Owing to the prolonged drought many plants suffered, the water supply available being inadequate to meet the necessary demand certain arrangements were made previously with the railway authorities for a supply of water, but this supply was unobtainable.

Insect Pests.

With the exception of mealy bugs and black blight no serious outbreak of pest was observed, and the above have been kept under control.

Experiments.

Owing to the adverse season experimental work had to be postponed.

Distribution of Plants.

The usual demands for plants have been met. It is gratifying to note that much interest is yet being taken by the general public in the farm. Hundreds of plants, economic and ornamental have been sold and a goodly number have been distributed free.

Contributions.

The farm is indebted to those persons who have so very kindly contributed supplies of seeds, etc., which will tend materially to assist in the raising of various plants.

Visitors.

With the re-opening of the local train service visitors from Mombasa and elsewhere avail themselves of the opportunity of visiting the farm.

Correspondence.

Various correspondence requesting information in connection with tropical agriculture has been received and dealt with.

Coconut Beetle Traps.

I supervised the maintenance of the coconut beetle traps at Mombasa, Rábai, Changamwe, etc.

I have the honour to be,
Sir,
Your most obedient servant,

J. P. DOPWELL.

APPENDIX **M.**

ANNUAL REPORT

OF THE

Government Stock Farm, Naivasha,

FOR THE YEAR ENDED

31st March, 1920.

DEPARTMENT OF AGRICULTURE,
NAIROBI EXPERIMENTAL FARM,
KABETE,
May 7th, 1920.

THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I have the honour to submit the Annual Report of the Government Stock Farm, Naivasha, for the year ended 31st March, 1920.

When I took over the Acting Management of the Farm on the 7th May, 1919, all the stock were suffering from the effects of the severe drought in 1918-1919.

The Farm has been overstocked during the year under review owing to the female stock, both cattle and sheep, not having been drafted and sold at the annual sale in May, 1919. These were not then in a fit condition owing to the recent drought, and it was decided to offer them for sale at a later date.

Good rain fell in April and May, 8.23 ins. having been recorded for these two months. A splendid growth of grass was the result, which enabled me to secure a record crop of hay. The two hay sheds were filled and two big stacks built in the field. An exceptionally heavy crop of green maize was cut and put into pits for ensilage and fed to the bulls, etc., in the dry season.

The rainfall for the year is given as under:—

1919		ins.
April	... ...	5.43
May	... ...	2.80
June	... ...	1.88
July	... ...	1.34
August	... ...	1.11
September	... ...	0.25
October	... ...	2.90
November	... ...	1.27
December	... ...	0.66
1920		ins.
January	... ...	0.12
February	... ...	
March	... ...	4.74
	Total ...	22.50 ins.

CATTLE.

Pure Breds.—Frieslands.

The cows of this breed have proved to be good milkers, and regular breeders; the young cattle grow up well, are hardy and realise good prices.

The herd consisted on March 1st, of:—

108 head.

Pure Breds.—Ayrshires.

The herd contains some good types of the breed, all fully pedigreed. They are very useful animals, good milkers, regular breeders and the young cattle are hardy. The bulls were not in very great demand last sale and did not fetch such good prices as the Frieslands.

The herd consisted on March 1st, of:—

77 head.

Pure Breds.—Shorthorns.

We have had a very unfortunate year with the Shorthorns. Owing to inoculation for Rinderpest in October, 1919 a large percentage of the cows aborted and seem to have become barren. The increase therefore is very disappointing.

The herd consisted on March 1st, of:—

48 head.

Pure Breds.—Herefords.

The herd consisted on March 1st, of:—
8 head.

Pure Breds.—South Devons.

Three South Devon Bulls were imported from South Africa in October, 1919 and sold at the Annual Sale on February 13th last. The prices realised by these bulls averaged higher than those obtained for bulls of any other breed.

Grade Cattle.

There has been a very fair increase in these. The second cross or three-quarter bred grows out well, and is strong of constitution.

The herd consisted on March 1st, of some
150 head.

Importations.

In October, 1919 a number of bulls were imported from South Africa ex s.s. Berwick Castle.

They arrived in a very poor condition and required a lot of attention and feeding. They were put up for sale in February last. The prices realised are dealt with under the heading "Annual Sale."

SHEEP.

Merinos and Merino Grade Sheep have shown good results both in wool and in increase. The graded Merino sheep up to the sixth cross have done remarkably well without any indication of loss of constitution the higher the grade.

Lambs.—The Merino pure breds gave a percentage increase of 69½, and a flock of 666 grade ewes gave 95% of lambs, of which 80 were in the first lambing season, namely June and July, and the remaining 15% in December, the latter being from those ewes which did not lamb in the earlier season.

Heavy losses have occurred among the sheep from Blue Tongue, which I am dealing with under the heading "Diseases." Flocks have been regularly dosed for wire worm.

Suffolk and Lincoln Grades have not proved so satisfactory. They are good mutton sheep but not so robust in constitution as the Merinos and suffer more from wire worm. The increase is fair, but there is a very considerable mortality among the young stock.

KARAKUL.—It will be remembered that three Rams were presented by the Government of the Union of South Africa in June, 1918. A most interesting experiment is being carried on by crossing these rams with native ewes. About 80% of the progeny are black and show an indication of producing a marketable fur in the second cross. The increase has been remarkably good and the young stock are hardy and of good constitution.

One of the rams unfortunately died from an injured liver incurred in a fight during the night with another of the same breed.

WOOL.—The sheep were shorn in November and the wool was good, clean and freer from earthy matter than in any previous year. The fleeces were lighter than in previous years, but this decrease in weight is due to the greater freedom from dirt in the wool. Forty-five bales weighing 17,292 lbs. have been sent to the London market, but up to the time of writing no Account Sales have been received.

The following are details of the November, 1919, shearing:—

	Averaged each lbs.	ozs.
3 Imported Merino Rams	14	0
20 Boonoks Farm Bred Rams	15	0
Stud Boonoks Farm Bred Ewes	8	6
Flock Merino Ewes	7	1
Flock Merino Hoggets	6	13
5th Cross Merino Ewes	6	0
4th Cross Merino Ewes	6	8
5th Cross Merino Hoggets	6	0
5th Cross Down Merino Hoggets	6	0
4th Cross Lincoln/Merino Ewes	6	8
Mutton Grade Ewes	3	5
Grade Lincoln/Merino Hoggets	5	8
5th Cross Down Merino Ewes	6	7
4th Cross Down Merino Ewes	5	11
Lincoln/Merino Lambs, 5 months old	2	0
Mutton Grade Lambs	1	3
Merino and Merino Grade Lambs	2	4

The prices realised in London in December, 1918, are given below:—

	Per 16s.
1917 CLIP.—21 Bales Merino and Grade Wool ...	33½d.
1918 CLIP.—14 Bales ,, ,, ,, ...	28 d.
4 Bales Merino and Grade Wool ...	27½d.
4 Bales Pieces	20¼d.
2 Bales Bellies	18½d.
1 Bale Down Wool	16½d.
2 Bales Lambs Wool	20 d.
1 Bale Mohair	18 d.
Total Proceeds ... £2545	7s. 11d.
Sweepings ... 1	17s. 8d.
£2547	5s. 7d.

Goats.

These have done well and show a considerable increase.

Donkeys.

The grading up of the donkeys with Catalonian Jacks appears to be a success. The ¾-bred show good qualities and distinct improvement on the ½-bred. The increase has not been satisfactory and a new Jack was imported from South Africa in October, 1919.

Horses.

The Stallion "Royal Fox" still continues to be in good demand by Settlers although 17 years old. He stands his years well and is a sure foal getter.

Annual Sale.

The sale which should have been held in March, 1919, but which was postponed on account of the drought, was held on 2nd May, 1919. His Excellency the Governor, Major Gen. Sir Edward Northey, attended and took a keen interest in the proceedings. Pure bred and grade bulls were in great demand. Merino rams were sold at fair prices, which, however, were exceeded by those obtained for the Suffolk Grade Rams. I give below the prices realised:—

		Average. Rs.
8	Shorthorns	1,294
1	Ayrshire	1,875
6	Frieslands	1,225
4	Shorthorn (Grade)	628
3	Ayrshire (Grade)	450
130	Merino Rams (Pure bred)	38
50	Merino Ewes (Pure bred)	23
100	Merino Ewes (Grade)	13
50	Mutton Rams (Grade)	71
47	Merino Rams (Grade)	25
5	Angora Ram Goats (Pure Bred)	33
30	Angora Ram Goats (Grade)	14
100	Wethers	18
4	Native Jackasses	60
10	Catalonian Jackasses (Grade)	72
10	Donkey Mares	112

Another sale was held on the 13th February, 1920, His Excellency the Acting Governor, Sir Charles Bowring, attending, when 103 Bulls, imported and Farm bred were put up for auction. The prices realised were very low compared with previous years.